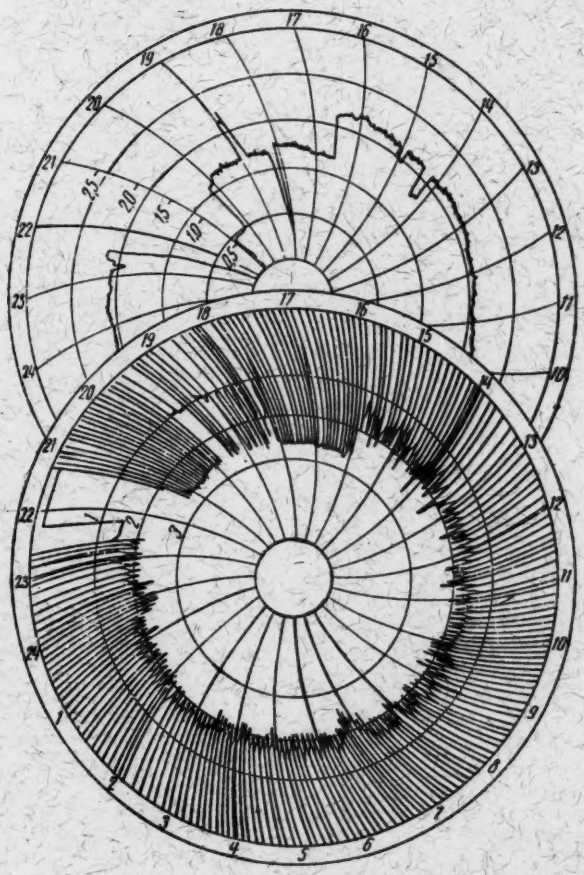
number 7

july 1958

METALLURGIST

translated from Russian



МЕТАЛЛУРГ

metallurg

CONSULTANTS BUREAU, INC.

DENDRITIC CRYSTALLIZATION

by **D. D. SARATOVKIN**

2nd Edition,
Revised and Enlarged

Translated from Russian

THIS SIGNIFICANT volume has been extensively revised by the author from the 1953 edition; in particular with *fresh material derived from observations under the stereoscopic microscope.*

The first section deals briefly with some general concepts on crystallization, drawing an important distinction between *genetic* and *structural* types of crystals, including some aspects of the *defect crystal state.* The second section covers at length the illuminating ideas and observations of the 19th-century Russian metallurgist D. K. Chernov, who proposed many of the basic ideas of dendritic crystallization. The third section is an extended survey of current views on dendritic crystallization, in which the ideas of many Soviet and other scientists are briefly summarized and criticized. Section four presents the growth forms of real crystals; all types are reviewed, but only dendritic or closely related forms are selected for subsequent investigation.

Following sections discuss the causes and forms of crystal growth, with *detailed applications* to certain substances that have been extensively studied *(particularly the ammonium halides),* and to eutectics in metal and organic systems; a completely revised presentation on steel castings which provides a lucid explanation of how the various structures found in real castings can be fitted into the author's theory of dendritic crystallization. Nearly all the concepts developed earlier in the book are utilized in this final section.

The main bulk of the volume contains many *original* and *unpublished* ideas and observations, and is an excellent example of the modern macroscopic approach to the crystalline state by an experienced worker concerned with the infinite variety of real crystals—all of which is enhanced by a *profusion of explanatory line diagrams and sets of stereoscopic photographs.*

CB translations are by bilingual scientists, and include all photographic, diagrammatic and tabular material integral with the text.

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THE HAPPY DAY

V. A. Podzerko

Chairman of the Central Committee of the Metallurgical Workers Trade Union

The metallurgists of our country greeted with great pleasure the decree of the Presidium of the Supreme Soviet of the USSR on the establishment of the Metallurgist's Day, which will be held annually on the third Sunday in July. This decree is a great occasion for Soviet metallurgists; it shows a deep appreciation of their work and bears witness to the fatherly care of the Communist Party and Soviet Government for the development of the metallurgical industry and the well-being of the workers. The Metallurgist's Day will be celebrated for the first time on July 20, 1958.

The Soviet people have adopted the useful tradition of summing up past work on notable occasions – appraising past achievements objectively and outlining plans for the future.

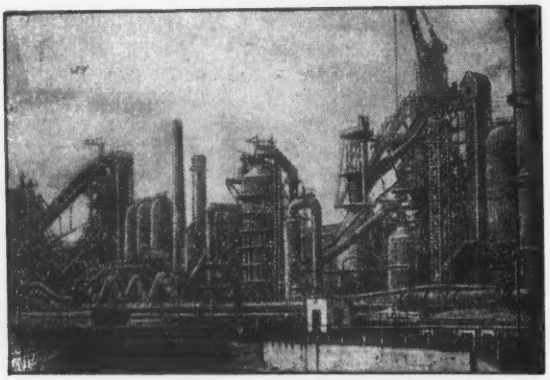
Following this tradition, Soviet metallurgists are reviewing the past development of ferrous metallurgy – the basis of the whole national economy.

Many blast-furnace workers, steel melters and rolling-mill operators still remember 1913. At that time, tsarist Russia occupied fifth place in the world in the output of pig iron, steel and rolled product. Then the First World War broke out, and this was followed by three years of Civil War. The seven years of war left the iron and steel industry in a complete decline; 115,800 tons of pig iron, 194,300 of steel, and 147,300 of rolled product – that was the total output of the metallurgical works of our country in 1920.

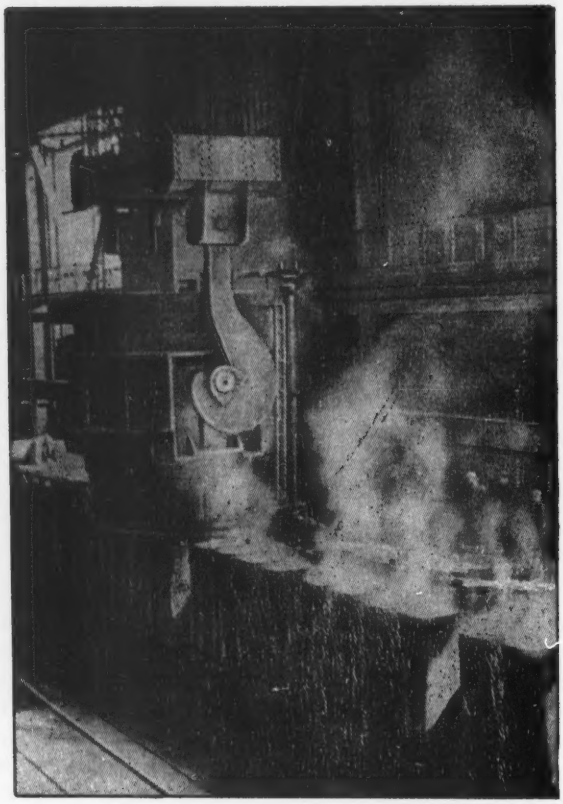
The Communist Party put before the Soviet people the great task of the restoration and expansion of the whole industry and first of all the iron and steel industry. After eight years of heroic work, the output of ferrous metals in the Soviet Union in 1928 reached the level of 1913. This was a considerable achievement; after all, the output of ferrous metals in 1920 was only a small fraction of the 1913 level – just over 2.7% of pig iron, 4.6% of steel and 4.2% of rolled product.

These successes, however, in no way made the Soviet people complacent, since the output of ferrous metals in pre-Revolution Russia was much lower than in many European capitalist countries, not to mention the United States of America. In response to the appeal of the Communist Party, the nation rose to new feats in overcoming the economic backwardness of the country; a heroic fight for the transformation of the backward country into a powerful, industrial state began. In the steppes of the South Ural, in the expanse of West Siberia, in the works near the Dnieper rapids and at the old works in the South, in Central Russia, and in the Ural the creative work of people from all parts of our immense country was in full swing. The first Five-Year Plan began! One after another rose the stacks of the future metallurgical giants, the Magnitogorsk and the Kuznetsk Metallurgical Combines, and of the Zaporozhstal and Azovstal Works. A radical reconstruction of old works commenced. At the end of the first Five-Year Plan, the Magnitogorsk and the Kuznetsk Combines and the Zaporozhstal Works were put into operation. During those years, new powerful blast furnaces were built and put into operation at the Makeevka, the Dzerzhinskii, the Alchevsk and the Azovstal Works.

The years passed. By 1941, 94 blast furnaces, producing nearly 14 million tons of pig iron, were in operation in the USSR. Steel output in 1940 constituted 17.9 million tons and rolled product output more than 12.5 million tons.



Blast furnace plant of the Voroshilov Works in Alchevsk.



Steel teeming in the open-hearth furnace plant of the Cherepovets Metallurgical Works.

Photo by K. Muzyk

In the pre-war period, the rate of growth of the ferrous industry in the Soviet Union was far ahead of the most highly industrialized capitalist countries. Prewar Germany needed 22 years to increase their pig iron output from 4 to 14.5 million tons and the USA needed 19 years. Soviet metallurgists achieved that task in the course of seven years. Even our enemies from the capitalist camp, who frequently forecast a failure of the

Five-Year Plans, had to admit that the rate of growth of the iron and steel industry in the USSR is without precedent in world history.

The treacherous aggression by Hitler's Germany interrupted the peaceful development of our national economy. All metallurgical works in the South were put out of action. Many works in central Russia were operating under extremely difficult conditions, in particular during the first years of the Great Patriotic War. The development of the Soviet iron and steel industry was held up.

The Communist Party appealed to metallurgists for new feats. Blast furnace operators, steel melters and rolling mill workers in the Ural and Siberia, who were joined by many metallurgists evacuated from the southern regions of the country, occupied at the time by the enemy, were working selflessly for victory over the enemy. Tens of thousands of women came to metallurgical plants and took the place of the husbands, fathers and brothers who had gone to the front.

Working stand of the 900 mill at the Nizhne-Tagil Metallurgical Combine. The screw-down equipment, the main drive and the roller tables of this stand are automated; an electronic computer has been installed.

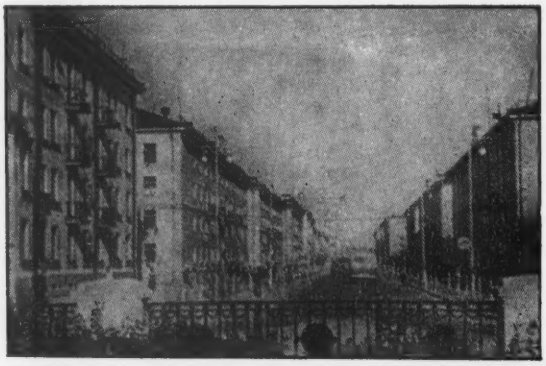
Under difficult war conditions, when the eastern regions with their rich deposits of manganese ore were cut off, the blast-furnace operators of Magnitogorsk organized the production of ferromanganese from lean ores of the Ural and Kazakhstan. Metallurgists and designers in the Ural and Siberia built and put into operation, during the war years, new blast furnaces at the Magnitogorsk Combine, Chusovsk, Novo-Tagil and Cheliabinsk Works, and reconstructed shut-down blast furnaces at small works in the Ural – the Staroutkinsk and the Verkne-Uraleisk Works. During those years 29 open-hearth furnaces were built in the eastern regions of the country, and new steelmaking centers were established in Azerbaidzhan, Kazakhstan, and Uzbekistan – the regions which had previously no iron and steel industry of their own. The selfless work of Soviet people ensured uninterrupted supplies of steel for the war industry.

The war, forced upon our nation, not only retarded the growth of the iron and steel industry but also caused a substantial fall in the volume of steel production in our country. At the end of the war, the annual output of pig iron in the USSR was only 8.8 million tons, of steel – 12.2 million tons, and of rolled product – 8.5 million tons. And the fight to rebuild the national economy, ruined by the war, and for a further development of our industry, began again.

In this fight, the metallurgists were, and are now, in the first ranks. The two postwar Five-Year Plans resulted, not only in a reconstruction of the iron and steel industry, but also in considerable progress. As early as 1950, the reconstruction, which was combined with the modernization, of wrecked metallurgical works was completed and the prewar level of production was attained. In 1957, 37.0 million tons of pig iron, 51.0 million tons of steel, and 40.2 million tons of rolled material was produced in the Soviet Union.. These achievements are the result of the incessant and inspired work of Soviet metallurgists under the guidance of the great Communist Party of the Soviet Union. Such a rate of economic growth is unknown in any country in the world.

The ferrous industry of the USSR achieved its successes not only in the quantitative expansion but also in the improvement of production technology. The equipment of our works is much more efficiently utilized than in foreign countries. For instance, in 1957, the utilization coefficient of blast furnace volume was 0.79 in the USSR and approximately 0.98-1.0 in the USA. This means that from each cubic meter of the blast-furnace volume our blast-furnace operators obtain approximately 20% more pig iron than the blast-furnace operators at American works.

In 1956, the output of steel per one square meter of the open-hearth furnace floor in the USA was, on the average, 5.6 tons, and in the USSR – 7.21 tons (7.5 tons in 1957).



Cherepovets. Metallurgist Street.

Photo by K. Muzyk

The technical progress in the ferrous industry of the USSR is characterized by a considerable increase in the capacities of units. Whereas in tsarist Russia the average volume of blast furnaces was 190 cu m, in 1956, the average volume was 748 cu m, blast furnaces of 1386 cu m volume being put into operation in recent years. As early as 1956, the furnaces of over 1,000 cu m constituted 60% of the total blast furnace volume.

The size of open-hearth furnaces increased also. There are 375-t furnaces at many of our works, and 500-t furnaces have been put into operation.

The higher technical level of the iron and steel industry of the USSR compared with the USA, England, the Federal German Republic, and other capitalist countries is indicated by the number of blast furnaces operated at an elevated top pressure and with a constant-humidity blast, the number of open-hearth furnaces with basic roofs, the capacities of rolling mills, etc.

An exceptional part in the impressive successes achieved by the metallurgists during the years of the Soviet regime was played by the socialist competition, which became the principal method for the establishment of a new, communist society in our country.

Nizhne Tagil. Palace of Culture of the Nizhne-Tagil Metallurgical Combine.

TASS Pictorial Review

The socialist competition in our country became a genuine nation-wide movement. Under the guidance of the Communist Party, the trade unions every year improve the forms and methods of competition, drawing in wider ranges of workers. Tens of thousands of outstanding people – leading foremen of metallurgical production, whose names are well known at home and abroad–developed their skill at the establishments of the metallurgical industry in the course of socialist competition. The development of the ferrous industry and its technical progress are bound with such names as Korobov, Mazai, Nevchas, Iakimenko, Kochetkov, Zakharov, Zinurov, Semenov, Privalov, Serkov, Luk'ianov, Chursinov, Mukharkin, Lygun, Minzaripov, Somov, Martynov, Nebilitsyn and others. Many of these metallurgists became statesmen, deputies to the Supreme Soviets of the USSR and the Union Republics. The senior foreman of the No. 1 open-hearth plant of the Kuznetsk Metallurgical Combine, M. M. Privalov, is now a member of the Presidium of the Supreme Soviet of the USSR.

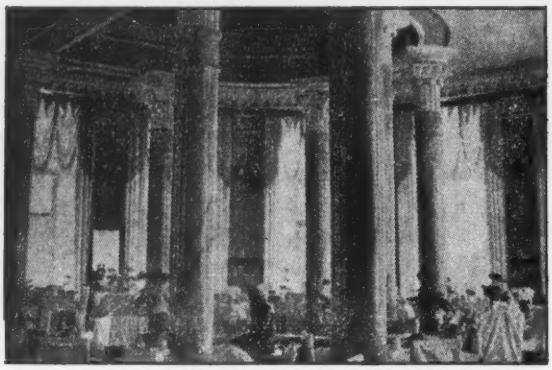
Cherepovets. New school in the metallurgists' settlement.

Photo by K. Muzyk

As a result of the efforts of economic organizations and of trade unions on technical education, and as a result of the establishment of a wide network of schools and courses and facilities for study in technical schools and universities, without the interruption of their work in industry, the technical level of personnel rose considerably. There are already some establishments, e. g., the Kuznetsk and Magnitogorsk Combines and other works, where every other worker has secondary education.

The care of the Communist Party for the improvement of material well-being is felt by every worker and clerk in the metallurgical industry. Heavy and exhausting work at iron and steel works is now a long-forgotten past. The mechanization of labor-consuming processes made work easy and inspiring. A 7- and 6-hour working day has been introduced in the ferrous industry and wages have been increased.

Every year more and more houses are built and the socialist metallurgist towns – Magnitogorsk, Stalinsk, Rustavi, Zaporozhe, Komsomol'sk, Pervoural'sk and others – are becoming better and better. The ramshackle huts of the Demidov period in Nizhne Tagil were replaced by new blocks of multistoried, comfortable houses completely transforming the character of this old town in the Ural. A large number of hospitals, polyclinics, schools, kindergartens, and nurseries were built for the metallurgists and their families.

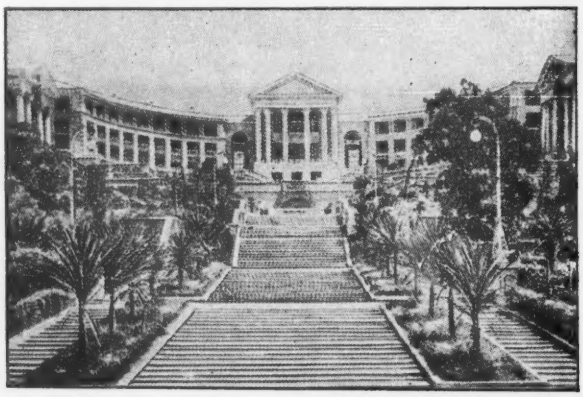


Dining-hall of the "Metallurg" Sanatorium in Crimea.

Clubs, palaces of culture and libraries with a stock of about 14 million volumes – all this is a powerful means in the hands of trade unions for the communist education of workers and the satisfaction of their cultural and spiritual needs.

A huge amount of money from the state budget of the USSR is ear-marked for the social insurance of workers in the ferrous and nonferrous industries. A large part of this money is spent on arranging rest and medical treatment, on children's health, physical culture, and sports. More than 10 billion rubles were spent on these amenities in the past six years alone.

Every year more than two hundred thousand workers from the metallurgical industry are medically treated or rest in the sanatoria, rest homes and tourist centers. More than 200 thousand of the metallurgists' children spend their summer vacation in pioneers' camps. In the sanatoria and dispensaries, set up at the works, up to 20 thousand workers are served annually.



The "Metallurg" Sanatorium in Sochi.

The Soviet people are never complacent about their successes, no matter how impressive the achievements may be. Celebrating the Metallurgist's Day, we are fully aware of the scope of the gigantic tasks put before metallurgists by the historic resolutions of the 20th Congress of the Communist Party of the Soviet Union and outlined in N. S. Khrushchev's speech at the jubilee session of the Supreme Soviet of the USSR. Over the next

fifteen years the volume of production in the important branches of industry has to be doubled or trebled; in particular, the annual output of 75-85 million tons of pig iron and 100-120 million tons of steel has to be achieved.

Soviet metallurgists will spare no pains and energy to carry out the task successfully; they are well aware of the fact that the successful completion of our country's main economic task – in the shortest time possible to draw level with, and then to overtake the most highly developed capitalist countries in the volume of industrial output per head of population – is aimed at a steady improvement of the standard of living of our people. In the name of this noble aim Soviet metallurgists, as all Soviet people, have been working with great enthusiasm in the past year and are working even more keenly at present. The output planned for the first quarter of 1958 has been achieved in all sectors of the iron and steel industry: 9.5 million tons of pig iron, over 13 million tons of steel, over 10 million tons of rolled product, and 21 million tons of processed ore (by 5%-7% more than in the first quarter of the previous year).

The number of inventors and innovators has increased considerably; they number at present about 150 thousand in the metallurgical industry. They have submitted more than 250 thousand innovations in the course of the past year. As a result of the adoption of these innovations, a saving of about 900 million rubles has been effected.

By the Metallurgist's Day every single establishment, plant, unit, and mine should have completed the planned schedule. The Nizhne-Tagil Combine, the Krivoi Rog Metallurgical Works, and the Zaporozhstal Works have to make up for lagging behind schedule in the first quarter, in order to reach the planned output in all branches of iron and steel production. To attain and to better the target of production in 1958 is the most important task of our metallurgists: it is envisaged that 39.1 million tons of pig iron, 53.6 million tons of steel, 42.7 million tons of rolled product, 50.6 million tons of coke, and 87 million tons of ore prepared for smelting, should be produced.

The celebration of the Metallurgist's Day will give a new impetus to the creative enthusiasm of the workers and technical and administrative personnel at the establishments of the metallurgical industry in their new labor successes for the attainment of the sacred aim of our nation – the establishment of communism.

THE FIGHT FOR TECHNICAL PROGRESS

ACHIEVEMENTS AND PROSPECTS

Interview with the Director of the Kuznetsk Metallurgical Combine,

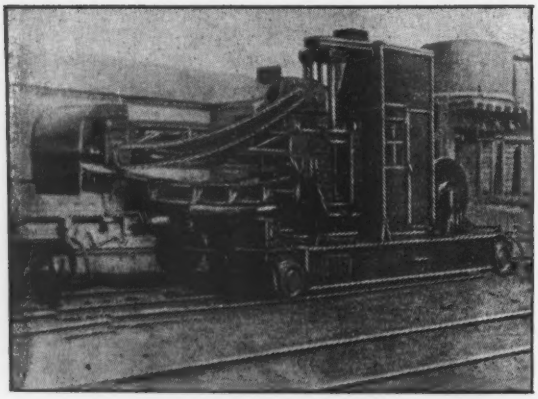
B. N. Zherebin

Question: When celebrating their festive day, what achievements could the Kuznetsk metallurgists claim?

Answer: The metallurgists of the Kuznetsk Metallurgical Combine have achieved the output target for 1957. The gross output increased by 5.3% in that year; pig iron output increased by 6.2% steel output – by 1.1%, and rolled product output – by 1.9%.

The builders of the ore basin of the Kuznetsk Metallurgical Combine have, in the main, completed the construction of the Abakansk mine and have put it into operation. The construction of the Teisk and the Kazsk mines in Khakassiia and Gorna Shoriia has begun. In the existing mines, work on the improvement of methods of ore mining – first of all the improvement of drilling and blasting operations – is being done. Our mines are now changing over from relatively inefficient methods of mining to the methods of ore breaking by deep blast-hole drilling. I should like to mention here that in the Temir-Tau mine, deep blast-hole drilling is employed exclusively.

Our blast-furnace operators have substantial successes. At the blast-furnace plant, furnace No. 3 is being automated and automation is being introduced into the operational control of other furnaces as well as air-heating stoves.



Loading and unloading operations at the Kuznetsk Metallurgical Combine are mechanized. The picture shows a machine with horizontal scrapers for unloading loose materials from railroad cars.

The coefficient of furnace volume utilization was 0.68 in 1957. Not very long ago, during the repairs of blast furnace No. 4, its air-heating system was fully automated.

In the open-hearth plant, six open-hearth furnaces have been converted to vaporization cooling. An experimental hydraulic apparatus for the remote control of the stopper rod of the ladle has been installed and successfully operated. 12 ladles are already provided with remote-control equipment. The average output of steel per square meter of the open-hearth furnace floor at the Combine reached 9.81 tons.

An apparatus for the evacuation of transformer steel has been introduced and put into operation at the electric steelmaking plant. The structural steel mill has started, during the past year, the production of five new sections; the medium-section mill – three new sections; and the section mill – five new sections. A machine for stamping hot billets has been put into operation at the 900 mill. The control of the manipulators of the blooming mill without a reducing gear is being introduced; no other works so far has done this.

Considerable progress has been achieved in the field of automation. The speed of the sintering chain at the Abagursk sinter plant is automatically controlled. The charging of the sintering chain is also automatic.

The KIP* and automation plant is now working on the problem of the automatic weighing of pig iron on the casting machines during loading onto railroad cars. The automation of cast pig iron quality control is being developed.

Machines for opening the steel tapping hole are being introduced at some of the open-hearth furnaces.

Question: Could you tell us, please, about the development prospects of the Kuznetsk Combine for the near future?

Answer: Compared with 1958, the volume of output of the Combine in 1965 – i. e., in seven years – should, according to our preliminary plans, increase as follows: ore output by 116%, sinter production by 115%, pig iron production by 45%, and steel and rolled product by 19%. We have to provide accommodations amounting to approximately 650,000 sq. m floor area.

By 1963, we should be fully supplied with our own ore exclusively; at present, the Combine has to get some of the ore from outside.

In the next few years, one more blast furnace and two coke batteries with enlarged chambers (30 cu m volume compared with the 21 cu m of the present chambers) should be built.

By 1963, an oxygen plant should be built for the open-hearth plants. Unfortunately, in the State Plan of the USSR, the question of the construction of a second blooming mill, which would eliminate one of the worst bottlenecks at the Combine, has not yet been settled. The point is that we produce more steel than we can roll. I estimate that the Combine could complete the work on the construction of the second blooming mill by 1961.

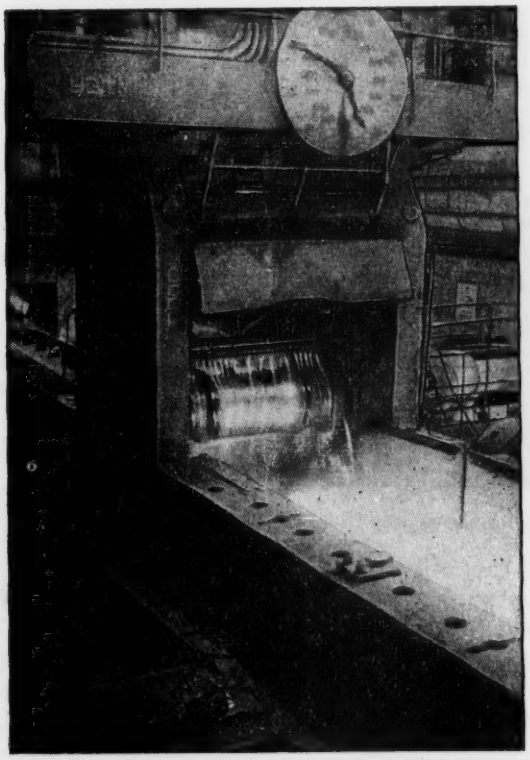
THE ALCHEVSK METALLURGISTS ARE FULFILLING THEIR OBLIGATIONS

P. Gmyria

Director of the Alchevsk Metallurgical Works

The Voroshilov Metallurgical Works in Alchevsk, established 62 years ago, has changed during the Soviet rule, and in particular in the past 5-6 years, into one of the largest metallurgical establishments in the country.

Prior to the October Revolution the Works had six blast furnaces, 300-350 cu m volume each, seven open-hearth furnaces, and some section mills; the output of pig iron, steel and rolled product did not exceed a quarter of a million tons. During the years of the First and the Second Five-Year Plans, two fully mechanized blast furnaces of 930 cu m and 1030 cu m volume and a new by-product coke plant were put into operation.



Ingot rolling at the blooming mill of the Voroshilov Works.

During the German occupation the Works was completely ruined. In 1943, the reconstruction of the Works began and at the same time a radical modernization was undertaken with a view to incorporating the most recent advances of science and technology. The work on constructions was in full swing at the Works' site.

On March 31, 1952, two open-hearth furnaces were put into operation. In the same year, a 2250 medium-plate mill was started. In the period between 1952 and 1955 blast furnace No. 3, six more open-hearth furnaces, a large cogging mill, and the 2800 thick-plate mill were put into operation. 1956 was a memorable year for Alchevsk metallurgists: they had the honor of starting the largest 500-t open-hearth furnace in Europe. Last year a large blast furnace, No. 4, was blown in; the construction of the 500-t open-hearth furnace is being continued, and the first coke-oven batteries are being put into operation at the new by-product coke plant. The new, as well as the old, units are being equipped in accordance with the most recent advances of science and technology.

Four blast-furnaces have been made suitable for operation at an increased top pressure; the steam-air blast is introduced at the blast-furnace plant and the technology of the process involving the use of partly fluxed sinter has been mastered. The adoption

of an intensive cooling of the top of the blast furnace No. 5, which produces ferromanganese, has made it possible to increase the time between overhauls from 2-3 to 10.5 years.

At the open-hearth plant, the thermal regime control has been automated, program control of thermal processes is being introduced, the main roofs of the furnaces have been lined with heat-resistant magnesito-chromite brick, vaporization cooling has been introduced, compressed air is blown into the gas port to intensify the steelmaking process, and removable slag pockets are employed.

All steel rolling operations are mechanized at all the mills.

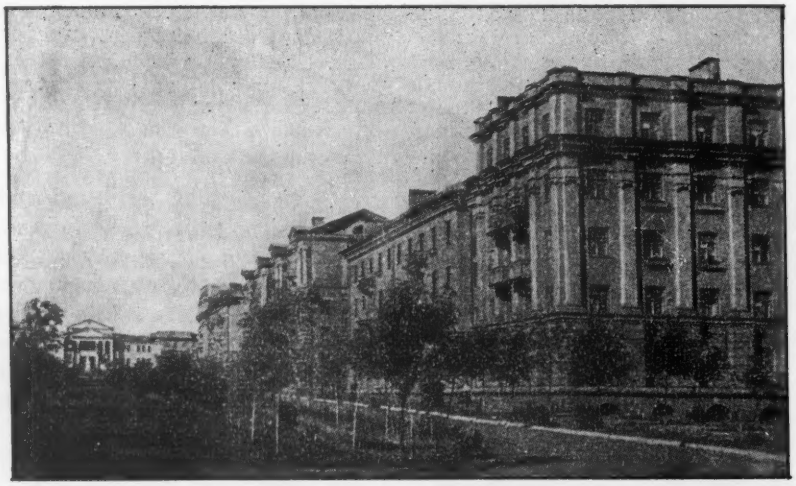
Our metallurgists substantially increased the production of high-quality steel. The production and rolling of new grades of low-alloy steels (MKhGS, I9G, SKhL-1, SK, MK, 09G2 and several others) which are intended for large diameter gas pipes, ships, bridges, etc., have been mastered.

Our Works expands rapidly. The overall productive efficiency at the Works increased by 56.6% from 1952 to 1957; the blast furnace operators improved their productive efficiency by 86.8%, the steel melters by 130.9%, and the rolling mill operators by 173.9%. The production cost of steel decreases continually and in the very near future it will be one of the lowest in the Ukraine.

At present, we are finishing the drafting of a several-year plan for Work's development. During 1959-1965 it is envisaged that two large blast furnaces, a second open-hearth plant with large-capacity open-hearth furnaces, a second cogging mill, a 1700 continuous sheet mill, a cold-rolling plant, a tube plant, and two sinter plants should be put into operation. Compared with 1958, the output of pig iron will increase by a factor of 2.5, of steel – by a factor of 2.4, and of rolled product – by a factor of 2.4.

Modern methods and technology are to be extensively introduced; oxygen and natural gas will be employed in open-hearth steelmaking, highly fluxed sinter in the blast furnace charge, etc.

With the growth of the Works came an increase in the ranks of the metallurgists who not only were successfully mastering new methods but also were improving them.



Dwelling houses of the employees of the Voroshilov Works.

The names of the gas operator of blast furnace No. 3, Chekalkin; steel melters of the open-hearth plant, Voitenko and Grabko; the senior operator at the main control post of the 2250 mill, Gorlinskii; the senior welder of the 2800 mill, Sushko; the turner at the machine shop, Fedurchenko, who is already working towards the 1960 plan; the locomotive driver, Luganskii, who initiated the competition for the longest running time between two washings of the locomotive, and many other names became widely known.

Our innovators contributed a great deal towards the improvement of the production of pig iron, steel and rolled products. In the years 1952-1957, 2907 innovations, which resulted in more than 30 million rubles saving have been introduced.

In Voroshilovsk, the town of metallurgists, miners, coke-industry workers and constructors, many new blocks of multistoried, well-appointed houses have been built. New schools, nurseries, and kindergartens are being opened every year. New medical establishments are being built. A much-appreciated gift for the metallurgists, miners, and engineers of Donbass was the opening of the Mining and Metallurgy Institute in our town. The building of a Palace of Metallurgists and, by the end of 1958, a new wide-screen cinema, will be completed.

In the course of the past two years, district central heating has been installed in the town, and in 1959-1960 the main residential centers in the town will be provided with gas. The main problem, however, for the next years still remains in housing. In recent years, accomodations amounting to 20 thousand sq m floor area have been built annually and, beginning with 1959, it is envisaged that 40-50 thousand sq m of floor area should be added in order to solve the housing problem of metallurgists in 4-5 years.

In the four months of 1958, the Works produced thousands of tons of pig iron, steel and rolled product over and above the target envisaged by the State Plan. The output of pig iron increased by 16.3%, of steel by 18.4%, and of rolled product by 11.4%, compared with the corresponding period of the previous year. A stubborn fight to stay ahead of schedule goes on in every section of the works in order to fulfill the obligations accepted by the Alchevsk metallurgists – to produce, by the end of the year, 6000 t of pig iron, 8000 t of steel and 10,000 t of rolled product over and above the planned output.

15 YEARS OF THE CHELIABINSK WORKS

G. E. Evchenko

Deputy head of the Technical Department of the Cheliabinsk Metallurgical Works

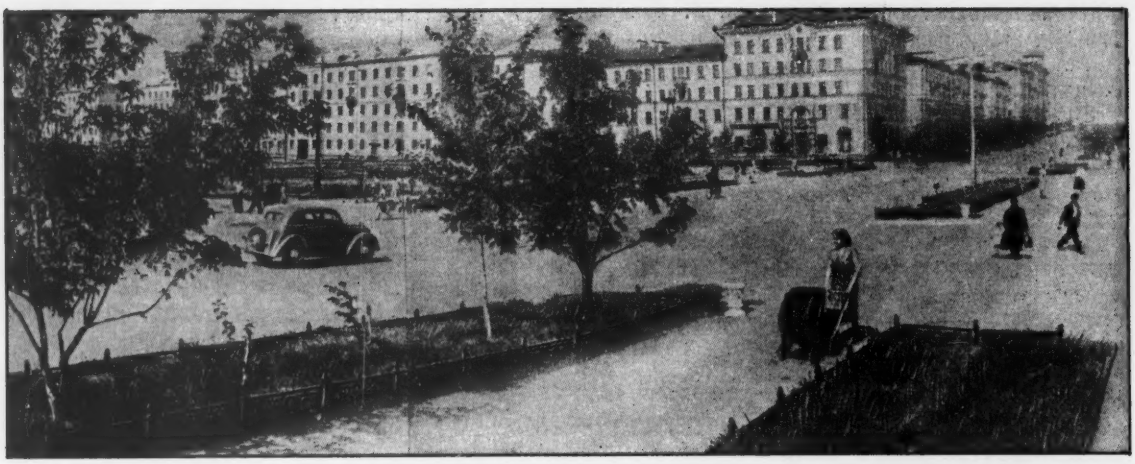
On the decision of the Party and the Government, at the severe time of the Great Patriotic War at the beginning of 1942, the construction of the Cheliabinsk Metallurgical Works began. And on April 19, 1943, the first batch of steel was produced by the electric steelmaking plant. Very soon the blast furnaces, coke batteries, and rolling mills were put into operation. By the end of 1944, all the plants of the complete metallurgical cycle were in operation. The starting of the Works was an important achievement as high-quality steel was badly needed by our war industry.

In 15 years the Cheliabinsk Metallurgical Works became a large concern. The assortment of steel grades produced is very wide, more than 300 different grades of steel being manufactured. It would be difficult to find a single industry of our country where Cheliabinsk steel, from which various parts and equipment weighing from a fraction of a gram to many tons are manufactured, is not used.

Introducing new technology, modernizing machinery, and improving production methods, the personnel of the Works constantly increases the output of pig iron, steel, and rolled product. In recent years, we have converted our blast furnaces to operation at an increased top pressure, blast at a high temperature and of a constant humidity being employed. The charge of the blast furnaces contains up to 50% of fluxed sinter.

This year, the blast furnace operators began to employ oxygen-enriched blast in the production of ferrosilicon.

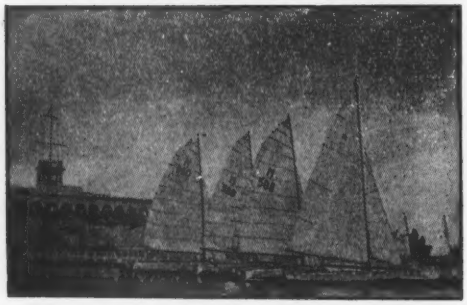
All open-hearth furnaces are provided with a vaporization cooling system. The idling periods of the furnaces on hot and cold repairs have been reduced owing to the mechanization of the operations on refractory brickwork removal where special elevators, scraper hoists, and equipment for breaking the brickwork are employed. The output of steel at open-hearth plant, No. 1 was 30% higher in 1957 than in 1955.



Stalevary Street in Cheliabinsk

The efficiency of the electric furnaces for steelmaking rose owing to an increase in the weight of the charge, the installation of heat-resistant roofs, and the modernization of the transformer cooling system. The output of the electric furnace plant increased in 12 years by a factor of more than 2.7, without any new furnace being installed, and the steel output per 1000 kw transformer capacity almost trebled. Oxygen is extensively employed in steelmaking processes.

For a long time, a large number of operators were employed on labor-consuming operations at the 350 mill. At the end of 1956, table rollers and pull-over equipment for the transportation of rolled steel were installed. In this way, 15 mill operators were made free for other duties. By the introduction of repeaters at the 240 and the 300-1 section mills, the transfer of the rolled piece from one stand to another was mechanized and 15 operators were made free for other duties.



Water station of the Cheliabinsk Metallurgical Works on the Kasargi lake.

In the past two years, the rolling of special grade steels on mills equipped with repeaters has been mastered, the flame scarfing of alloy steel has been adopted, and the technology of alloy-steel heat treatment, which ensures a flake-free steel structure, has been mastered.

In 1958-1965, the Works will rapidly increase the output of pig iron, steel, and rolled product. Compared with the actual output in 1957, the output of pig iron in 1965 should increase by a factor of 2.5; of steel, by a factor of 2.9 (steel made by electric methods should increase by a factor of more than 5); and the output of rolled product should almost treble. At that time, it is planned to put into operation at the Works the largest blast furnaces in the country which would be operated with up to 100% of sinter in the charge. The electric steelmaking plant, employing the duplex process, will be provided with 80-t electric furnaces and converters designed for the oxygen blowing of liquid metal.

Metallurgists Avenue in Stalingrad.
Photo V. Smetannikov

By the end of 1965, the introduction of three more section mills, a roll-design plant, and a heat-treating plant are envisaged. In this way, the assortment of products will be enlarged and the importance of our Works in the national economy of the USSR will be still more enhanced.

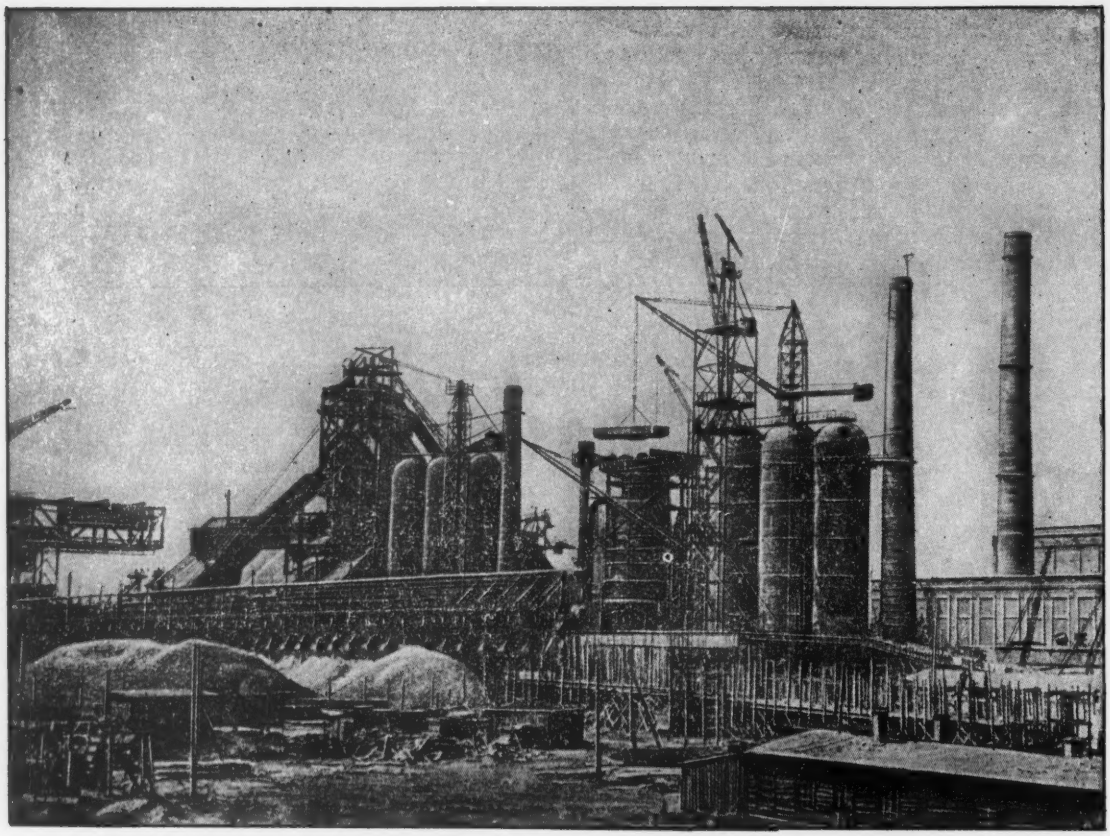
THE ORSK-KHALILOVSK METALLURGICAL COMBINE

A. I. Sukhorukov, Director of the Combine, and I. V. Arkhipov, Chairman of the Works' Trade Union Committee

In the Orenburg province, the Orsk-Khalilovsk Metallurgical Combine and the town of iron and steel workers, Novo-Troitsk, developed during the postwar years. Not far from here are deposits of iron ore which contain chromium and nickel. Therefore, the chief production of the Works is naturally alloyed steel. At present, we have in operation one blast furnace, one open-hearth furnace, two Bessemer converters, a plant for the direct reduction of iron and other plants.

In the first quarter of 1958 the first open-hearth furnace was put into operation, and now the second-stage construction of the heating and power plant is about to be completed.

At present the second blast furnace is being erected, and it should be put into operation on September 30, 1958. The Komsomol members of the Combine and of the building organizations took patronage of the erection work and have undertaken to have the furnace ready to be put into operation one month ahead of schedule. The Komsomol organizations of the many factories which make the equipment for this furnace assist greatly in the erection work by supplying the ordered materials ahead of the delivery dates.



The blast furnace plant of the Orsk-Khalilovsk Metallurgical Combine.

A 2800 rolling mill is being built, and the construction of a sinter plant comprising four sinter chains has been started. Two of the sinter chains should be put into operation in 1959.

The building of the Novo-Troitsk town is in full swing.

In the course of the next few years the construction of the Combine should be completed. The blast-furnace plant will then have four blast furnaces. The steelmaking plant is designed for the duplex process, involving Bessemer converters and open-hearth furnaces. It is planned to install three converters and five open-hearth furnaces. The plant will also include an electric steelmaking section with two electric furnaces. The rolling plant will contain a blooming mill, a thick-plate mill, a heavy-section mill, and a light-section mill.

Mechanization and automation will be incorporated in all plants of the Combine in accordance with modern technology.

In the course of the construction and the operation of the Combine the ranks of skilled metallurgists have increased.

The names of an outstanding furnace attendant, G. P. Shepelev, a senior operator of runners at the blast furnace plant; N. A. Deriabin, a senior converter operator in the Bessemer section of the duplex plant; S. F. Dedinkin, an operator in the benzene section of the by-product coke plant, P. Ia. Panchenko and others, became well known throughout the Combine. The ranks of skilled young workers also increased. Outstanding young workers – the electrician D. A. Kamenskii, the senior gas operator at the blast furnace plant V. P. Shishkin, the press operator A. A. Lebedev, the operator of the turbo-blower at the heating and power plant A. D. Kozhevatov, and many others,–labor side by side with the veteran workers.

"KAZAKHSTANSKAIA MAGNITKA"

A. P. Popov

Director of the Karaganda Metallurgical Works

In Central Kazakhstan, the erection of one of the largest metallurgical combines in the country is in full swing.

With a view to utilizing the coking coal of the Karaganda deposits and newly discovered iron ores of the Atasuisk deposits, one of the works of the third coal and metallurgy center of the East is being built. It will be of extreme importance for a further development not only of Kazakhstan itself but also of other republics of Central Asia.

The importance of the new metallurgical works for our country was very accurately defined by the people themselves who called the new establishment the "Kazakhstanskaia Magnitka" – the Magnitogorsk of Kazakhstan. Such a definition of the role of the future works puts great responsibility on the builders and operators: to build the works as fast and as well as the Magnitogorsk Combine was built, and to operate the blast furnaces, open-hearth furnaces and rolling mills in the most efficient manner.

Thanks to the iron ore and coaking coal resources, and the planned irrigation of Central Kazakhstan by building the Irtysh – Temir-Tau canal, there are possibilities for a large-scale development of the ferrous industry; an increase in pig iron output in the Kazakhstan Republic to 20 million tons and an increase in the output of steel to 25 million tons in the next 20 years is envisaged. This in turn will allow for a large-scale development of heavy industry.

What will the Kazakhstanskaia Magnitka be like in 1964 when the construction of the works, as now planned, will have been completed?

A by-product coke plant comprising several modern coking batteries will be put into operation. Simultaneously with the production of coke, a large-scale production of agricultural fertilizers, pitch, benzene, naphthalene, and many other valuable chemical products will be set up. The plant will include a large coal-preparation plant.

Living quarters in Temir-Tau

The blast furnaces will use fluxed sinter only. In addition to other sintering chains at the sintering plant, two chains of 200 sq m sintering area each will be introduced. Several blast furnaces with an insular layout are to be built at the blast furnace plant.

At the steelmaking plant, it is planned to build the largest open-hearth furnaces and Bessemer converters in the country. They will be situated in blocks, each block comprising two units. Each block will be a completely independent section with its own crane and railroad equipment, thus providing favorable conditions for efficient work on the casting floor. The weight of a steel ingot will be 15.8 t and 28 t.

The Works will produce hot-rolled and cold-rolled plate 0.15-10 mm thick and 700-1,500 mm wide, including a substantial amount of tin plate and terne plate. Of special importance is the tin plate, which is now in great demand.

At the erection site of blast furnace No. 1 of the Karaganda Metallurgical Works.

Technical advances of Soviet and foreign industries are made use of in the design of the works.

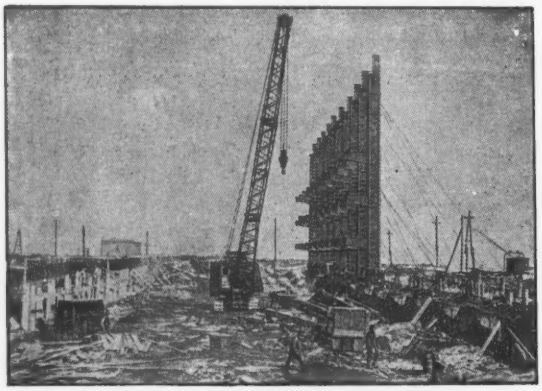
The top pressure in the blast furnaces will be not less than 1.5 atm and the temperature of the hot blast will be brought to 1200°C. The output of pig iron per worker of the blast furnace plant will constitute 11,000 tons per year, while at the best works in the USA it does not exceed 7,000 tons.

The soaking pits of the slabbing mill are of two-level design, fired from above, the slag being removed in liquid state; separate oxygen equipment for a continuous four-side flame scarfing of metal defects is also designed, the scarfing machine being able to remove a 1 mm - 5 mm layer of metal in one pass. Each set of pits will be equipped with measuring and controlling instrumentation for the automation of the thermal regime.

Before being rolled on the slabbing mill, the ingots will be weighed on the scales incorporated in a revolving equipment. Other automatic scales will be situated behind the slab shears. Water at 120 atm pressure will be used for the removal of scale from ingots in the course of rolling.

Behind the slabbing mill, a 1700 continuous-plate mill for rolling 1.2 mm - 10 mm thick plate from slabs is being installed. The coils from the mill will be uncoiled by special cutting machines,and plates of varying thickness will be obtainable. All the operations of these machines (coil delivery, grading, marking, weighing, and packing) will be mechanized and automated.

Four holding furnaces with coal gas and air heating will be built for heating slabs of up to 6.3 m length prior to their delivery to the 1700 mill. Coilers with expandable pulling drums are designed for the prevention of irregular coiling and for ensuring a tight coiling.

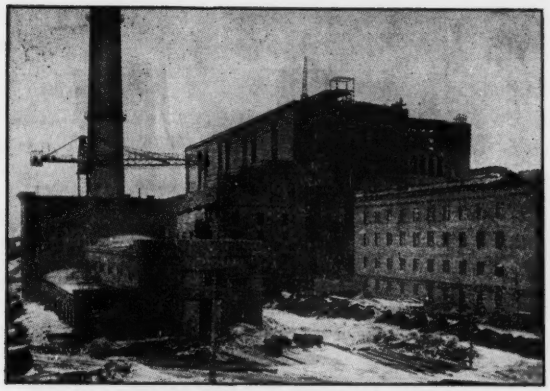


The construction of the first oven battery of the Karaganda Metallurgical Works.

In the hot-rolling plant a full mechanization of the sorting, weighing, packing,and marking operations is envisaged. A check on the thickness of plate and the detection of surface defects will be effected by means of a flying micrometer and a defectoscope mounted in the section of the cutting machine for plates and coils.

A very interesting plant will be the cold-rolling plant where two continuous mills are to be installed: a 1200 mill for rolling 0.15 mm-0.5 mm thick and 1000 mm wide sheet, and a 1700 mill for rolling 0.4 mm-2.0 mm thick and 700 mm-1500 mm wide sheet. The cold-rolling plant is a complex unit. Here the metal will undergo dressing, pickling, drying, oiling,and decoiling,and then coiling again and weighing.

Tin plate is to be manufactured mainly by electrolytic plating. Before plating, the coil is unwound and the end of the preceding coil is welded to the beginning of the next one, and the strip is passed through the degreasing, electrolytic pickling,and electrolytic plating baths, the machine for melting and hardening the protective coating, and washing and drying machines,in that order.



Power station of the Karaganda Metallurgical Works.

In addition to tin plate, the works will manufacture enameled, polished, and galvanized plates; dynamo, passivated, and strip steel; hot-rolled, heat-treated, and pickled steel; and other types of steel.

On the cold-rolling mills, the maintenance of the required thickness of the strip and the stretching of the strip between the stands, on the coiler and on the decoiler, is fully automated; and so is the temperature control of rolls, all operations of the strip cutting machines, electrolytic and hot-dip plating machines, and the lubrication and emulsion supply during the rolling operations.

The bent-section plant is of great interest; it will be producing large quantities of angles, beams, Z-shaped, channel and other special sections, for machine-building and construction-engineering industries, from plate steel 2 mm-10 mm thick, 80 mm - 1,200 mm wide, and up to 12 mm long. The advantages of cold bending allow the manufacture of steel product 2 mm or more thick, and this cannot be done on any hot-rolling mill; moreover, considerable savings in metal are achieved as a result of this method of manufacture (compared with hot rolling) because a more economical section can be designed without its strength being affected.

Up to 2,500 dimensions of sections can be obtained on the roller-bending machines. The machines are automated as much as possible and labor-consuming processes are to a large extent mechanized.

For the highly automated and mechanized rolled steel production, the Works requires highly qualified technical personnel and skilled workers.

Extensive plans are made for building residential houses and social and cultural establishments: it is planned to provide accommodation amounting to about half a million sq m floor area with gas supplies and the necessary amenities, more than 40 kindergartens and nurseries, tens of schools and libraries, a palace of culture, a few clubs, cinemas, restaurants, sport stadiums, parks, a hydrostation, a pioneers' camp, a rest home, and other buildings.

We have to prepare a good reception for the metallurgists joining our works by providing the most agreeable conditions for work and recreation.

At present, the by-product coke plant, the blast furnace and auxiliary plants, the power station, dwelling houses, and social establishments are under construction. In 1958 the electric power station will be put into operation, in 1959 – blast furnace No. 1 and two coke-oven batteries, and in 1960 – another blast furnace, a coke-oven battery, a sinter and an ore-dressing plant, open-hearth furnaces and a slabbing mill.

The economics of the works operation is very favorable; the works products will be the second cheapest in the country after the Magnitogorsk Combine's products. This is due, first of all, to the vicinity of available raw materials and fuels, and to the high degree of mechanization and automation of all the industrial processes.

The whole country is taking part in the erection of the "Kazakhstankaia Magnitka." More than forty design organizations are taking part in designing the works. The big machine-building works – the Novo-Kramatorsk in Donbass and the Uralmashzavod – will supply rolling equipment. A large amount of equipment will be supplied by the Leningrad Metal Works, the Lenin Works, and many other works.

Lenin's Konsomol accepted patronage of the erection of this giant of the iron and steel industry, and the Komsomol of Kazakhstan decided to join the construction work at the coal and ore centers of the works. At present thousands of youths, boys and girls, are joining in the work to fulfill the tasks outlined by the 13th Congress of the Komsomol.

We are now sending many boys and girls to the iron and steel plants of the Cheliabinsk and the Sverdlovsk Sovnarkhozes, so that they can be trained in various trades of the metallurgical industry. By 1964, the Karaganda Works will have many thousands of workers.

The Communist Party and the Soviet Government show great interest in the new works and assist greatly in ensuring the necessary supplies.

PRODUCTION AT THE ENAKIEVO WORKS IS AHEAD OF SCHEDULE

The Director of the Enakievo Works, Anatolii Fedorovich Minaev, told us about his works in an interview with our correspondent.

Rolling mill operators together with builders and the chief mechanic's staff undertook to finish the erection of the roller tables and two pushers in the crane bay of the open gantry by the Metallurgist's Day. In this way, the throughput of the 800 mill will increase and hence the capacity of the rolling plant will also increase. On the 800 mill, it will be possible to roll slabs for the medium-plate mill, for which it is now necessary to cast 240 kg ingots.

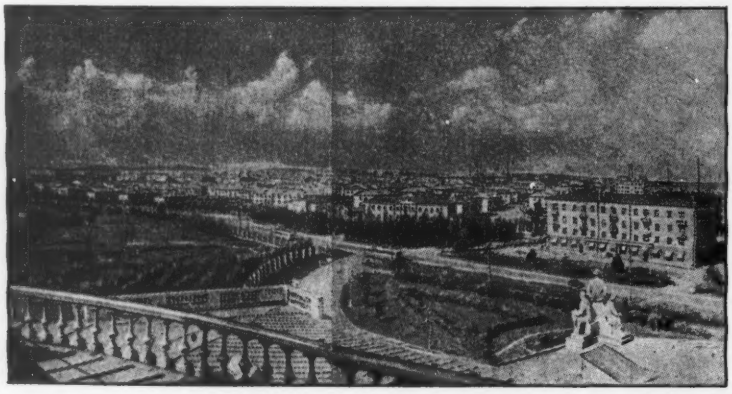
By the Metallurgist's Day, the construction of central distribution equipment with a 31500 kw transformer should be completed. It will eliminate all difficulties in power supply to the machinery of the works.

The blast furnace workers will mark the Metallurgist's Day with considerable successes.

A new blast furnace,No. 4-bis,is being built at the works. For the first time in furnace construction in our country, large reinforced concrete blocks were employed – some sections are of up to 40 t weight. Bunker gantry, skip pit and other parts were constructed from assembled reinforced concrete units.

The new blast furnace should be blown-in in September this year. A close collaboration of builders and metallurgists will ensure that the furnace will be put into operation on schedule. The manufacture of reinforced concrete blocks was organized locally by the builders and the metallurgists in the building of the casting machines where a 75-t crane was available.

It should be noted that the construction of the fourth furnace involved considerable difficulties. The problem is that a particular feature of the Enakievo Works is a one-side tapping of pig iron and slag. Under these conditions, it became necessary to divide the blast furnace plant into two sections. Gas ducts and other services had to be split into two parts and the conversion had to be carried out without disturbing the operation of the blast furnaces. The constructors, in cooperation with the metallurgists, coped with this task,and the personnel of the blast furnace plant maintains the production not only on, but even ahead of, schedule.



Settlement of workers and staff of the Nizhne-Tagil Metallurgical Combine.
TASS Pictorial Review

Taking into account the lessons of 1957, when the output was below the target specified in the State Plan, the personnel of the works markedly improved production in all sectors. In the first quarter of this year, the metallurgists of Enakievo produced thousands of tons of steel over and above the planned output.

The building of residential houses is very intensive at the works. Last year more than fifty two-apartment houses – a new settlement called the Fortieth Anniversary of the October – were built by the method of "popular building." It is envisaged that twenty four-apartment houses should be built this year.

The metallurgists of Enekievo have big and important tasks ahead of them; our seven-year plan of works development envisages a 40% rise in the volume of production. The output of sinter will increase considerably owing to the introduction of the fifth sintering chain. Two blast furnaces will be modernized and their volume increased. This will result in an increase of pig iron output.

It is planned to modernize the steelmaking plants. The No. 1 open-hearth furnace in the open-hearth plant will be reconstructed and its hearth substantially expanded. An increase in the volume of two converters in the Bessemer plant will also provide for an increase in steel output. Steel production is to be doubled in seven years.

Major changes will take place in the rolling plant of the works. A new blooming mill and a billet mill are to be installed and they will provide billets not only for the rolling mill of our works but also of the Konstantinovsk and the Kramatorka Works. The existing furnaces at the old blooming mill where the ingots are overturned manually, will be replaced by modern soaking pits provided with mechanical auxiliary equipment.

The existing rolling mills will also be modernized; in particular, at the 550 mill and the plate rolling mill, the steam engine and the gas engine will be replaced by electric motors. Electric power supplies will be markedly improved. Together with the 4-bis blast furnace a steam-and-air turboblower station will be built; it will completely solve the problem of steam and air supplies for the blast furnaces of the works.

Modern methods and advanced technology will ensure a rapid increase in operating efficiency. In seven years, the overall operating efficiency at the works will increase by 35% and will reach the level of the operating efficiency at newly built metallurgical works.

The personnel of the Enakievo Works is firmly determined to make their works one of the leading establishments of the Soviet iron and steel industry.

WE ARE INCREASING OPERATING EFFICIENCY

A. G. Trifonov

Head of the No. 2 open-hearth plant of the Magnitogorsk Metallurgical Combine

During the last year, operating efficiency of the No. 2 open-hearth plant at the Magnitogorsk Metallurgical Combine amounted to 154.6% as compared with 1950. In the first quarter of 1958, operating efficiency reached 100.9% of the planned efficiency, and in April it reached 101.9%.

Operating efficiency in the plant is increasing owing to a full use of machinery, progressive modernization of the furnaces, and the mechanization and automation of labor-consuming processes.

Since 1950, more than 100 innovations, aimed at an improvement of working conditions and the mechanization of labor-consuming processes, have been introduced. The most effective innovations were: the mechanized delivery of deoxidants in boxes and bunkers to the furnace and the casting sections; the mechanical sealing of the steel tap hole; the adoption of two-nozzle pouring of steel from the large ladle and the mechanization of steel pouring through an intermediate ladle; the adoption of an improved machine for fettling the open-hearth furnace; a complete elimination of manual work on furnace fettling; the control of steel distribution between the ladles by means of a special apparatus.

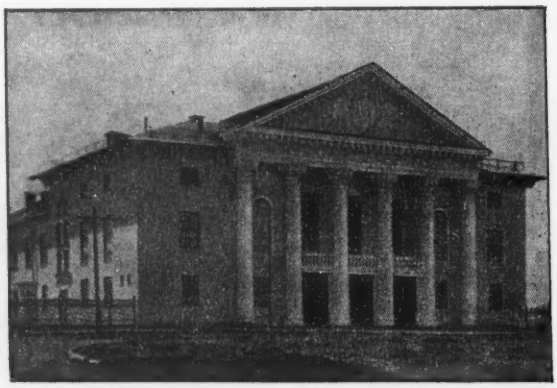
The steel ladles are now lined with Semiluki brick which increases the service life of the ladle lining from 8 to 15 heats. With a view to improving the working conditions of bricklayers and the organization of hot repairs of ladles and runners, two clay mixers, at the end of the plant, and conveyers for transporting bricks to the place of work, were installed.

The molds were changed from 1.3 cu m to 1.75 cu m. The combining of No. 1 and No. 2 open-hearth plants into one in March, 1957, resulted in making about 50 workers, and technical and administrative staff, free for other duties.

All these measures made it possible to change to a 7-hour working day without an increase in staff.

In the first quarter of 1958, the number of workers on the No. 2 open-hearth plant (combined) was 170 less (taking into account staff expansion on change-over to the 7-hour working day) than in 1950.

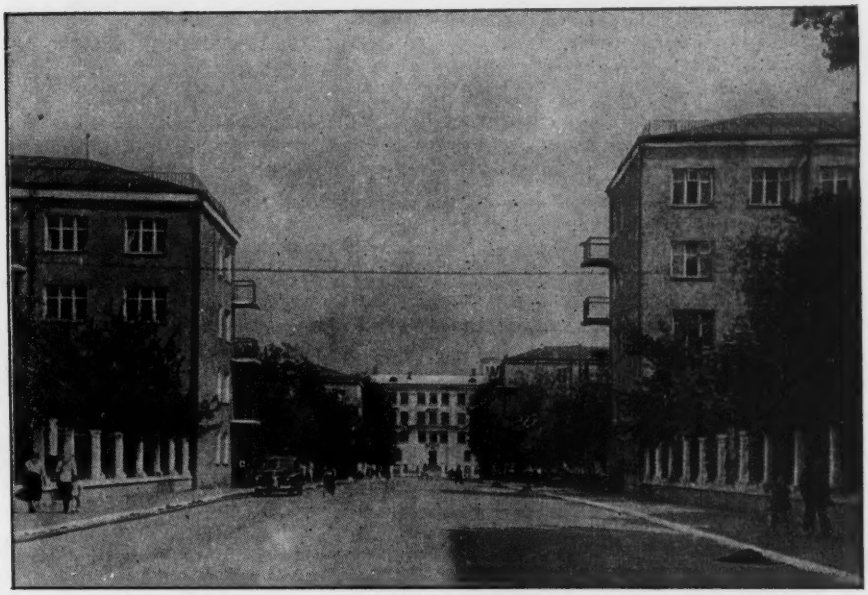
What are the ways to increase the operating efficiency of the plant further? We think that it is necessary: 1) to install a second mixer in order to ensure a continuous operation of furnaces without stoppages and to improve the technology of steel-making; 2) to modify the lining of liquid pig-iron transfer ladles in such a way as to increase the volume of the ladle to 90 t; three instead of four ladle loads of pig iron will be adequate for a large open-hearth furnace; 3) to install an additional casting crane; 4) to install one more clearing crane in order to improve the organization of work in the furnace section and to facilitate work on cold and hot repairs of furnaces; 5) to install a seventh charging crane and to place iron scrap on the charge yard in such a way as to enable all the magnetic cranes to operate simultaneously; 6) to blend iron ore according to its iron content; 7) to introduce vaporization cooling in order to reduce the hot stoppages of the furnaces.



Stalinsk. Metallurgists' Club at Tochilinskaia Place.
Photo P. Duplinskii

The assistance of the Cheliabinsk Sovnarkhoz is essential for the solution of a number of problems which are outside the authority of the works. For instance, for several months past the open-hearth plants have been supplied by the Satkinsk Works with a magnesite powder of rather large fractions, which does not ensure a normal

operation of the furnaces. We need magnesite powder of grain size not more than 8 mm. The powder "Ekstra" proved to be very satisfactory.



Magnitogorsk. Well-appointed houses of metallurgists in Pioneer Street.
Photo N. Nesterenko

One of the main reasons for the decrease in the life of the heat-resistant roof brick is the fall in its mechanical strength; hence the life of roofs made from this brick decreased by 50-70 heats as compared with 1956. The Satkinsk Works must improve the quality of bricks it supplies. Periklase spinellide brick proved to be quite satisfactory. The open-hearth furnace plant has to be fully provided with Semiluki brick for the lining of steel-pouring ladles and with fireclay brick for the regenerative checkers. In view of the fact that more and more furnaces of the plant are converted to fuel oil firing, it is necessary to secure supplies of low-sulfur fuel oil.

METALLURGISTS OF DNEPRODZERZHINSK

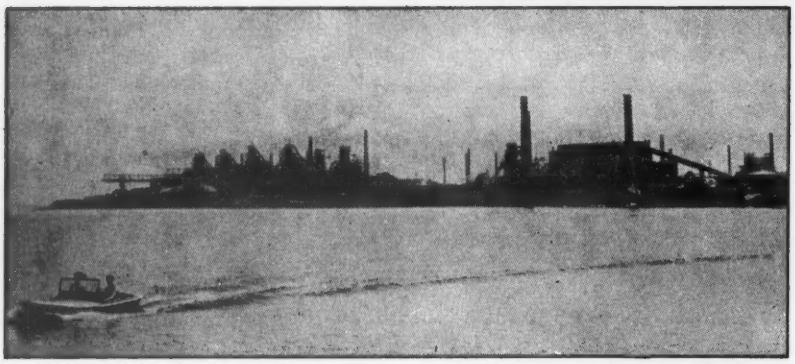
V. S. Sevast'ianov, Deputy Director of the Dzerzhinskii Works

S. S. Gurov, Deputy Chairman of the Trade Union Works Committee

At the end of the last century a foreign joint-stock company began the erection of an iron and steel works in the Kamenskoe village on the bank of the river Dnieper.

The shareholders were attracted by the extremely rich deposits of Donets coal and Krivoi Rog ore. Moreover, cheap labor was readily available. Soon, millions of rubles earned by the sweat and toil of workers were filling the pockets of foreign shareholders. Every hundred rubles invested into the enterprise gave forty rubles annual profit.

When the October Revolution began, detachments of the Red Guards of metallurgists from Kamenskoe fought for the Soviets. The armored trains "Sovietskaia Rossiia" and "Sovietskaia Ukraina," assembled by the workers of Kamenskoe, had a glorious history at various fronts during the Civil War.



View of the Dzerzhinskii Works from the Dnieper River.

Now a new town – Dneprodzerzhinsk – took the place of Kamenskoe village. There appeared new blocks of multistoried houses, several schools, hospitals, theaters, and social establishments.

Steel with the stamp of the Dzerzhinskii Works goes to all parts of the USSR and to many foreign countries. It was used for the construction of the Palace of Science in Warsaw, for the Ukhan'sk bridge in China, at the building sites of Bkhilai in India, and in workshops in Bulgaria and Egypt.

The workers of Dneprodzerzhinsk initiated the All-Union competition for achieving the target for the third year of the sixth Five-Year Plan ahead of schedule. The workers are keeping their promises. Production for the first four months of the year is ahead of schedule in all sections of the iron and steel industry: thousands of tons of sinter, pig iron, steel and rolled product, over and above the planned target, have been produced.

The personnel of the works fights for an improvement in the quality of product.

The steel melters of the third open-hearth plant plan, at the meeting during the change of shift every day, socialist undertaking with regard to output in the coming shift. Next day, the result of the last day's work is discussed at the inter-shift meeting. In this way, socialist competition becomes live and effective. The open-hearth workers are thus applying the method of Nikolai Mamai, a Donets miner. Since the beginning of the year tens of thousands of tons of steel in excess of the planned amount were produced.

Steel melter of No. 3 open-hearth plant at the Dzerzhinskii Works, Lukashenko, and foreman, Apal'kov.

Blast furnace operators, rolling mill operators, and workers of auxiliary plants are also following the example of Mamai. The senior furnace attendant of the No. 12 blast furnace, P. P. Lygun (who is a Deputy to the Supreme Soviet of the USSR), and the attendants – Susida, Khren' and Gorb – produced about 3,000 t of pig iron above the planned target.

The operators of the new rolling plant, Verkhoglad, Chuvachko, Fik, Dedushev, Kotov and Bogun, have to their credit several thousands of tons of ingots and billets rolled in addition to the planned amount.

The machine for a continuous calcination of limestone, designed by Works' Director, G. G. Oreshkin, engineer A. K. Rudkov, and scientist N. Z. Plotkin, and put into operation at the sinter plant, improved working conditions substantially and made it possible to increase the output of the sinter chains by more than 10%. The Bessemer converters are now controlled automatically and the end of the heat is determined spectrographically.

New electronic equipment has been installed for the first time in the USSR in the third open-hearth plant for the automatic control of the thermal regime of the furnaces.

New transfers for the section mills and new charging equipment for the blast furnaces have been installed.

This is a far from complete list of the modernizations already carried out. But the work done is only a part of an extensive program of future improvement.

We are preparing the automation of the blooming mills and soon we shall start the compacting of iron ore and the construction of a fourth converter.

The technology of production is constantly improving. The rolling mill operators are mastering the production of light, economic sections which are successfully used by the Gor'kii and the Moscow automobile works and other works in the country. The technology of the production of low-manganese pig iron and several high-quality steels has been improved.

There are about 4 thousand innovators and inventors at the Dzerzhinskii Works. The introduction of their innovations resulted in more than 12 million rubles savings in the last year. The outstanding innovator of our works is the electrician of the structural-steel mill, F. P. Taraba.

Advanced experience at our works is thoroughly studied, discussed, and extensively applied. This is one of the "secrets" of the successes of Dneprodzerzhinsk metallurgists. Thus, at present, there are 20 courses of advanced experience going on at the plants of the works where hundreds of workers are being trained.

Publicity for competitions is placed above all. Every month, in the Palace of Culture, we arrange meetings where the results of socialist competitions are reviewed. The placing of competitors is accompanied by lively discussions and the decisions are taken collectively.

Careless workmen, wreckers, violators of working discipline, negligent workers, and all those who try to get something for nothing from the State come between the "teeth" of the works' satirical paper "Crocodile" and come under the fire of the press and the Propaganda Department of the Palace of Culture. We could cite many cases showing how the "Crocodile" helps the workers put to right any shortcomings.

The metallurgists of Dneprodzerzhinsk Works heroically and aim at working today better than yesterday, and tomorrow better than today.

A GREAT INCENTIVE

A. E. Egorichev

Chairman of the Trade Union Works' Committee of the KMK

A great incentive in the development of the Kuznetsk Metallurgical Combine is socialist competition.

Socialist competition during the building of the Combine was conducive to completing the work in an extremely short time, unheard of at that period. During the second and the third Five-Year Plans, socialist competition was a great help in preparing the staff of highly skilled workers and in mastering new technology in the shortest time possible.

During the Great Patriotic War, All-Union socialist competition was initiated by the Kuznetsk metallurgists. The production achievements of Kuznetsk metallurgist in socialist competition were highly appreciated. For the successful completion of the tasks set by the State Defense Committee, the Kuznetsk Metallurgical Combine was awarded the Lenin Order, the Kutuzov Order-First Class, and the Order of the Red Banner of Labor. In the war years, the personnel of the Combine won the All-Union socialist competition more than once. Plants of the Combine gained the challenge banners of the State Defense Committee. After the defeat of the fascist aggressors, four banners were given in perpetuity to the outstanding plants of the works.

During the postwar Five-Year Plans, socialist competition assisted the personnel of the works to expand production capacity, to improve production processes, to increase output, and to improve the economics of the establishment.

The Combine accomplished the steel and rolled product output target set by the first postwar Five-Year Plan in three years, and the pig iron output target in three and a half years. The fifth Five-Year Plan was carried out ahead of time in all branches of metallurgical production, and the Combine was ahead of schedule in the first and the second year of the sixth Five-Year Plan.

Together with the workers of eleven establishments, the Kuznetsk metallurgists initiated the All-Union socialist competition of metallurgists in the previous year. The Combine carried out the production plan ahead of time and produced more than it promised in its socialist undertakings for 1957; thousands of tons of coke, pig iron, steel, and rolled product were produced over and above the planned amount.

In the beginning of 1958, the Kuznetsk Combine, jointly with the Dneprodzerzhinsk Works, initiated the socialist competition of metallurgists of our country and undertook more extensive socialist obligations. In the spring of this year, a competition for a worthy marking of the Metallurgist's Day and the 12th Congress of the Trade Unions of the USSR has developed.

Blast furnace operators and steel melters work with great enthusiasm; the blast furnace plant was ahead of schedule in the first four months of this year and produced many tons of pig iron above the planned amount; at the same time, the steel melters produced thousands of tons of steel in excess of the planned amount and reduced the amount of defective product by 15% as compared with the previous year.

Stalinsk. The Polyclinic of the Kuznetsk Metallurgical Combine.

For three months in succession, the winner in the socialist competition between the main plants of the works was the No. 2 open-hearth furnace.

The No. 1 blast furnace (foremen: Pospelov, Ashpin, Pershikov and Pashkin; senior furnace attendants: Iniutin, Silitskii, Starkov and Chernyshev) produced 3400 t of pig iron over and above planned production for the four months, and the No. 2 open-hearth furnace (steelmelters: Shabalov, Kuznetsov, Burkatskii and Slabyi) produced 1,600 t of steel above the planned amount.

Side by side with socialist competition within the Combine, i. e., between the personnel of individual plants and units and between individual workers, socialist competition with other metallurgical

establishments of the country is developing on an extensive scale. Thus, for instance, the rail-structural mill competes with the rail-structural mill of the Azovstal Works.

Stalinsk. The Kindergarten of the Kuznetsk Metallurgical Combine.

The competition between the Kuznetsk and the Magnitogorsk Combines became a traditional one. The socialist competition, based on professional friendship and friendly cooperation between the metallurgists of the two largest combines in the country, assists both combines in speeding up the introduction of new methods and advanced technology, in the efficient elimination of shortcomings in production organization, and in making full use of the advanced experience of leading workers.

To check the progress of the competition, a delegation from our Combine visits the Magnitogorsk Combine twice a year and we also welcome the guests from Magnitogorsk twice a year.

Personal contact between the representatives of the competing combines, friendly criticism, and observations on the adoption of the best production methods are of invaluable help to both combines.

In recent years alone, following the experience of Magnitogorsk metallurgists, we have changed over to the use of fluxed sinter in the blast furnace, which resulted in a 6-10% increase in the output of pig iron; at the open-hearth furnaces we introduced enlarged charging boxes which allow a speeded up charging of the furnaces and hence a reduction in the duration of a heat; also, we adopted a new type of molds with concave sides in which the loss of metal is smaller and the quality of the ingot is better. Following our experience, the Magnitogorsk metallurgists introduced a number of improvements in open-hearth and rolled steel production.

The new seven-year plan envisages an increase in the output of sinter of 80%, coke – 38%, pig iron – 45%, steel – 19%, rolled product – 19% and refractories – 40%. In order to accomplish these formidable tasks, it is imperative that creative initiative and interest of the personnel of all the plants of the Combine should be fostered still further and that all forms of socialist competition should be developed.

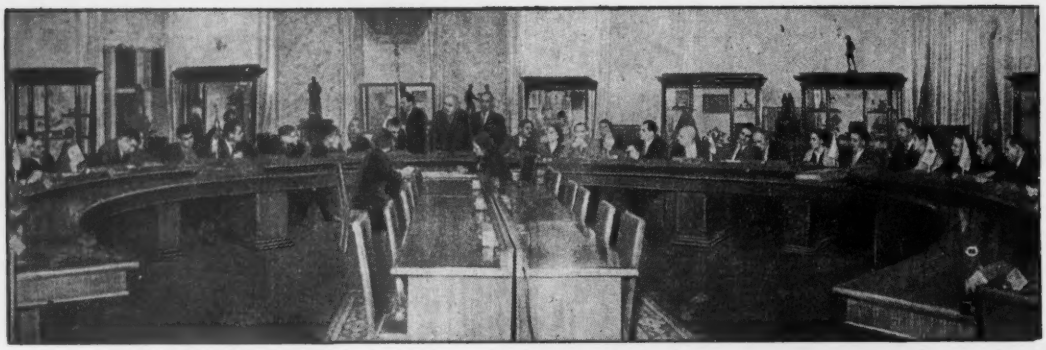
INTERNATIONAL RELATIONS BETWEEN METALLURGISTS

Iu. V. Khitsenko

Head of the Department for International Relations of the Central Committee of the Metallurgical Industry Workers Trade Union

International relations of Soviet metallurgists become more extensive every year. In the last two years, in particular, international relations have become very lively. Collective and individual correspondence, exchange of delegations, active participation in the International Union of Metal Workers to which the trade unions of metallurgical, mechanical engineering, electric engineering and electric power industries belong, – all this is made use of for the establishment of friendly relations with foreign metallurgists and for the common fight for peace.

Our Trade Union, the personnel of the industrial establishments, and individual metallurgists keep up regular correspondence with metallurgists of all countries ruled by people's democracy and with twenty capitalist countries.



VIIth session of the Administration Committee of the International Association of the Trade Unions of the Metallurgical and Mechanical Engineering Industries, in December 1957, in Moscow. Leaders of trade union organizations of sixteen countries (Bulgaria, Hungary, East Germany, Holland, India, Italy, North Korea, Luxembourg, Poland, Rumania, USSR, France, West Germany, Czechoslovakia, Chile and Japan) took part in the session.

Indian metallurgists taking a practical course at the open-hearth furnace plant of the Zaporozhstal Works. The photograph shows foreman I. S. Doroshenko (on the right) explaining to Indian students, Krishna Saran Shravastav and Baiaram Sing, controlling and measuring instruments and automation equipment.

Photo N. Sidoruk

Our correspondence with our colleagues in France, Italy, Belgium, India, Japan and Austria is very lively. Much less frequent, although not through any fault of ours, is correspondence with metallurgists of the USA, Federal German Republic, Sweden, Switzerland, and England. A regular correspondence with metallurgists of those countries and the establishment of closer ties with them are hindered by reactionary leaders of trade unions which belong to the dissident organization, the so-called "International Confederation of Free Trade Unions." The leaders do not allow members of their organizations to communicate in any way with the metallurgists of the Soviet Union or of countries ruled by people's democracy.

Nevertheless, in spite of difficulties, the metallurgists of these capitalist countries themselves try to find ways of establishing contact with their colleagues in the Soviet Union on their own initiative; they send us letters in which they write about the difficult living and working conditions of their workers in industry and express admiration for our country.

In the last two years our Trade Union's delegations visited Italy, Japan, China, Belgium, Austria, Sweden, France, East Germany, Czechoslovakia, Poland, Rumania and Hungary. At the same time we have been visited by delegations of metallurgists from Luxembourg, Japan, Czechoslovakia, China, Italy, Poland, Hungary, Yugoslavia, Austria, France, Belgium, and a combined delegation from West and East Germany.

The Central Committee of our Trade Union does everything possible to strengthen the contacts and friendship of Soviet metallurgists with metallurgists from foreign countries. We wish to fight together for peace and for the improvement of living conditions of workers in all countries.

STEEL ROLLING PLANTS AT THE ZAKAVKAZ METALLURGICAL WORKS

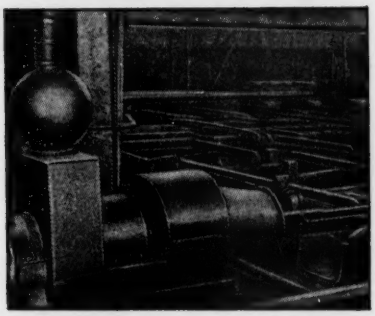
Since the first postwar Soviet 1000 mm blooming mill was put into operation at the Zakavkaz Metallurgical Works, work on its mechanization and automation has been in progress.

The transfer of ingots from the soaking pits to the mill is fully automated. The ingot buggy is automatically stopped at the appropriate pits and then the crane drags the ingot out of the chamber and places it on the cage of the ingot buggy. The operator of the crane gives the signal for the movement of the ingot buggy towards the receiving roller tables. Before the roller tables the buggy is decelerated and stopped, and the signal for lowering the cage is given. The ingot is removed from the buggy by the receiving roller tables. After the ingot is removed, the cage is raised and the ingot buggy goes back to a given group of soaking pits.

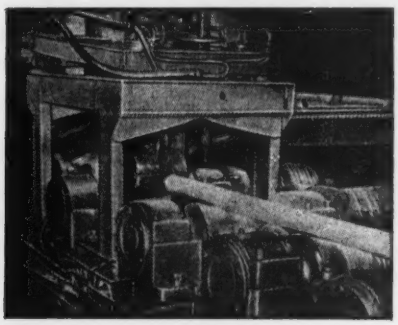
Brush-contact data transmitters, developed in the automation laboratory at our works, are employed for fixing the position of the ingot buggy. The transmitters ensure a reliable operation of the whole system.

The stamping of the hot material on the line was, until recently, the most arduous operation, requiring the expenditure of much manual labor. Now a stamping machine designed by TsNIITMASH* has been installed behind the hot-cutting shears, for stamping blooms and slabs on the 1000 mill. As a result of the introduction of this machine two markers have been made free for other duties.

A stamping machine, designed by an inventor at our works, V. G. Attarian, has been installed in the line of the tube-round mill. It stamps the tube rounds automatically. Owing to the adoption of this machine, the heavy labor of markers has been completely eliminated.



Machine for external and internal painting of tubes.

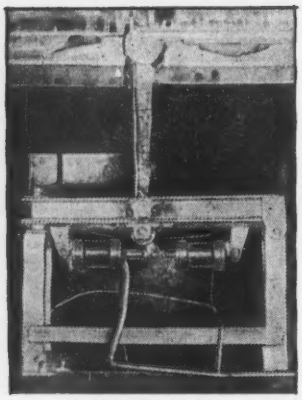


Stamping machine designed by V. G. Attarian for stamping tube rounds.

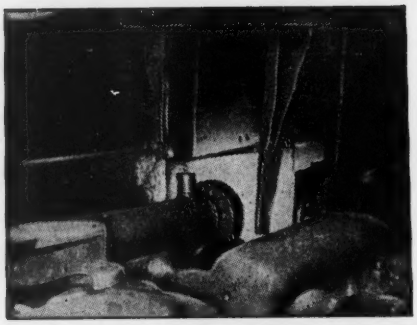
In the return line of the same mill a new stamping machine designed by V. G. Attarian, which stamps two square billets simultaneously even if their ends are not in alignment, has been installed.

On the largest (400) tube mill in Europe for the production of large-diameter seamless tubes, a centering apparatus for tube rounds, on the model of the pneumatic gun of Andreev's design, has been set up above the roller tables behind the ring furnaces. This arrangement has made it possible to eliminate manual centering of tube rounds with a gas burner and to ensure a high efficiency and quality of the centering operation.

*Central Scientific Research Institute of Technology and Machinery.



Machine designed by V. G. Attarian for stamping square billets in the return line.



Centering the tube rounds on the production line before the piercing stands of the 400 mill.

The first piercing stand of the 400 mill has been converted for operation with mandrels which are internally cooled and need not be changed, and in this way the heavy manual labor of operators on mandrel changes can be eliminated, the consumption of costly metal for the manufacture of pipe equipment can be reduced, and the quality of tubes improved.

A 112 m long section of the production line has been converted to automatic control. All the operations in the section of the roughing and the shaping mills and in the section from the shaping mills to the sizing machines have been automated.

A machine for the internal and external painting of the tubes has been designed at our Works and put into operation; the labor-consuming operation was eliminated and the quality of painting was improved.

THE KRIVOROZHSTAL WORKS

V. V. Kuz'menko

Deputy Head of section mill plant

M. A. Sukonnik

Head of the Technical Department

The main production plants of the Krivorozhstal Works were reconstructed or erected in the postwar period. The Works has the most modern technological equipment and the automation and mechanization of technological processes and labor-consuming operations is very extensively applied.

In recent years, hundreds of technical improvements, facilitating the work of operators and making a number of workers free for other duties in new plants, have been introduced.

At the sinter plant, the movement of self-unloading cars on the charge bunkers was automated by means of end throw-off; an automation scheme for the switch of the plate feeders of the iron ore receiving bunkers was introduced and thus a better blending of ore mixture was made possible; automatic control of proportioning tables of the bunkers in the charge section was introduced. Owing to the pneumatic removal of dust from the multicyclones, arranged at one of the sinter machines, much less labor is expended on the operation of the two-valve openings and belt conveyers, and working conditions are improved.

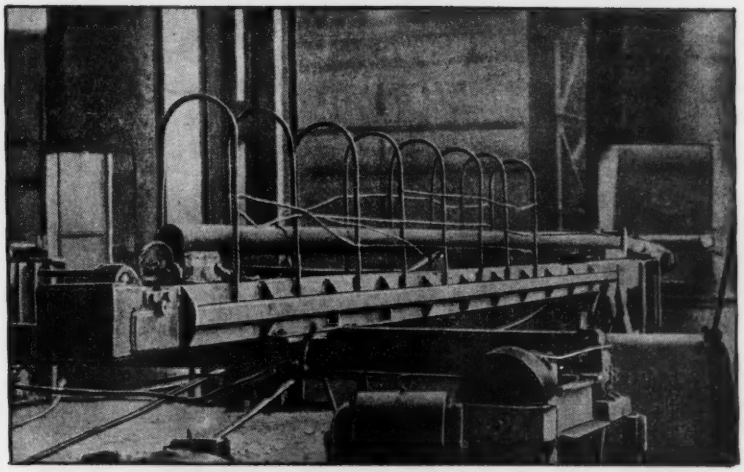


Fig. 1. Equipment for the removal of slag from the ladle of the hot-metal car.

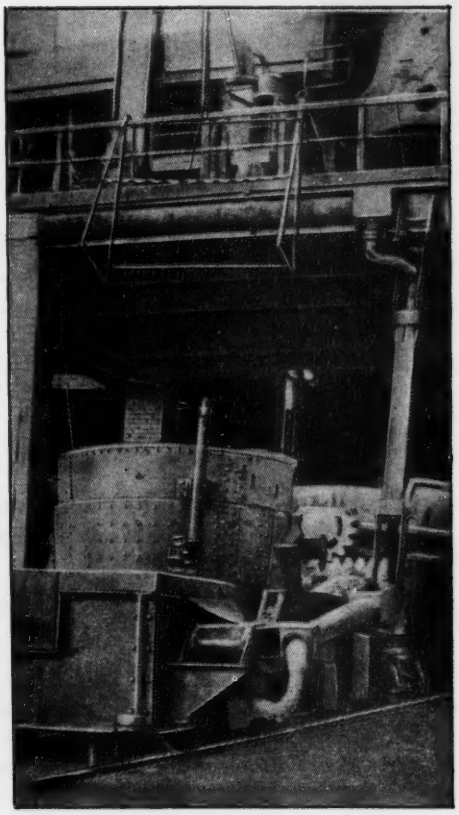


Fig. 2. Electrically driven buggy with the ladle in the Bessemer converter plant.

At present, work is in progress on the automation of the whole process of sintering and on its remote control.

Loading of charge materials, delivery to the furnace top, and charging into the blast furnace are effected by powerful ore-grabbing cranes, self unloading cars for the transportation of hot sinter, a belt conveyer system for coke transportation, scale-cars, skip hoists, and charging equipment. The skip hoists and the bells are fully automated.

The tapping yards of the blast furnaces are provided with overhead electric cranes by means of which the necessary materials are delivered to the hearth, debris and runner scrap are removed, crust is broken off the runners, etc.

Pig iron tapholes are opened with light electric drills mounted on a revolving support and controlled from a distance. After the tapping, the tapholes are closed by means of an electric gun adjusted for work at a high pressure. Mechanical stoppers for closing the slag notches are installed at the furnaces.

The blast furnaces are provided with a system of measuring, controlling, and automatic instruments; the temperature of the hot blast, the humidity of the blast, and the furnace-top pressure are automatically controlled.

Owing to a proper tightening of bunkers and the introduction of a special catching device for scale-cars, the spill of charge materials was reduced and 11 men were made free for other duties. The installation of mechanical hammers for the removal of pigs from the molds of the pig-casting machine and the introduction of appliances for gripping the pig which did not fall out of the mold made it possible to free 21 workers for other duties.

Loading and unloading operations at the cold pig iron store are carried out by five overhead magnetic cranes. The storehouse is provided with loudspeakers.

At the end of 1957 a new converter plant, where oxygen is blown from above into metal, was put into operation. Several mechanical devices at this plant facilitate the work of the operators.

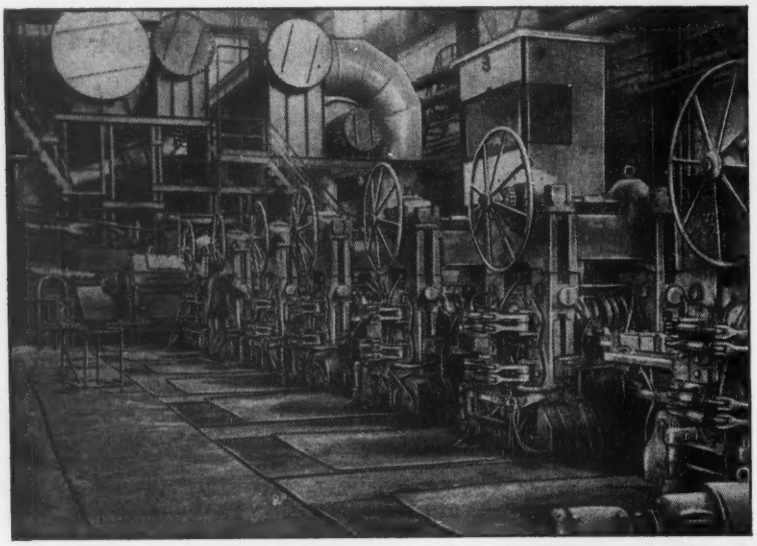


Fig. 3. The roughing train of the continuous light-section mill.

The mixer section is equipped with two cranes of 125/30-t load capacity; special equipment is provided for the removal of slag from the ladle of the hot-metal car received from the blast furnace plants (Fig. 1).

The converter section has one 150-t crane which can be used when converters with eroded refractory lining have to be replaced by newly lined spare converters. Charging machines of 3-t load capacity with charging boxes of 0.8 cu m volume, for charging scrap and other materials into the converters, are now being manufactured.

The ladles, with the metal from the converters, are removed on a special buggy operated by remote control (Fig. 2). Steel pouring is fully mechanized.

In August, 1956, a continuous light-section mill and in April, 1957, a continuous wire mill were put into operation. All the operations at these mills are mechanized and the speed of rolling is considerably increased.

Reheating furnaces of the rolling mills are gas fired. The heat of combustion products is utilized for heating the gas and the air in the recuperators. In this way the coke-oven gas can be dispensed with. The furnaces are fully automated.

Owing to the roughing train stands being arranged in one line (Fig. 3), the hot billets can be automatically transferred from one stand to another. The billets are turned around their axes by manipulators ensuring the appropriate rolling procedure. The duties of mill operators are limited to checking the dimensions of intermediate cross sections and ensuring that the manipulators are in good operational order. The one-line arrangement of alternating vertical and horizontal stands of the finishing train relieve the operator from entering the piece between the rolls.

Rolls are changed together with the complete housing. Roll-changing operation takes about 10 minutes.

The telescopic spindle coupling is so designed that the roll housing can be moved along the axis of the drive over a distance equal to the length of the barrel of the working rolls, and hence the axis of rolling can lie in one straight line through all the stands of a given train.

The front end of the rolled piece is cut off automatically before it enters the finishing stand; as soon as the piece approaches the photocell, the servomechanism of the shears is actuated. After an appropriate interval determined by time relay and depending on the speed of rolling, the piece is cut.

With the use of electronics and photoelectricity a reliable system of automatic control of mills has been designed and, owing to the automation of the mills, the speed of rolling has been increased to 15 m per second and 29.5 m per second on the light-section mill and the wire mill respectively.

THE AUTOMATION OF THE FIRST SOVIET RAIL-STRUCTURAL MILL

S. V. Gubert

Head of the rail-structural plant of the Nizhne-Tagil Metallurgical Combine

In the plant where the rail-structural mill is situated, all the operations from charging the billets into the heating furnaces to loading the finished product onto railroad cars are automated and mechanized. The wide range of complex products rolled at the mill called for the design of complicated equipment and the introduction of new methods of production. Such processes as the isothermic heating of rails to eliminate flake formation on the automatic production line for continuous mechanical and thermal treatment of rail ends are unique in the rail-rolling industry, at home as well as abroad.

Work on the automation of equipment at the rail-structural plant is carried out by the personnel of the Works Laboratory and of the plant itself. We began with projects for the automation of separate machine parts and separate sections of the plant. Subsequent combination of these sections will result in a full automation of the production line of our plant.

The main work was done on the automation of the rail production line where the majority of the workers were engaged. Rail-finishing lines were provided with new, highly efficient machines. The delivery of the rails to the rail-milling machines was mechanized by modernizing the manipulators and automating the approach movement of the cutter head to the rail end.

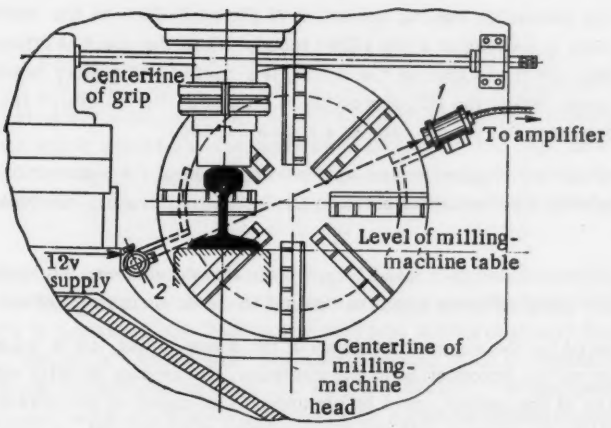


Fig. 1. Automation of the rail-end milling operation: 1) photocell; 2) light source.

The automation of the milling machine consists of the following. A light source and a photorelay (Fig. 1), situated both on one diameter, move together with the head but at a given distance ahead of the cutting tools. When the head approaches the rail end the beam of light is broken the relay operates and the head is set in the working position. The automation of this section resulted in an increased efficiency of production lines and a complete elimination of stoppages of the milling machines.

The rail-finishing lines were originally provided with hoods for heating the rail ends for hardening with high-frequency current. The system designed was found unsatisfactory and all attempts to improve it ended in failure. A complete redesigning of the equipment was necessary and only then was it included in the production line.

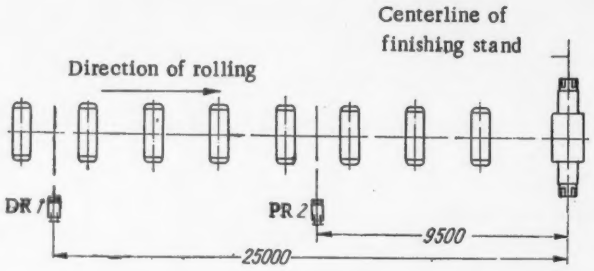


Fig. 2. Automation scheme for the two-high finishing stand.

Increase in the efficiency of the mills was held up for a long time because of the inadequate throughput in the section of the hot cutting saws. The automation of this section allowed a substantial reduction of the personnel, easier work for the remaining operators, higher efficiency of the saws, and a reduction in electric power consumption. The automatic control system includes roller tables, saws, a stamping machine, and the counting of rolled pieces.

Owing to the increased efficiency of the saws, the efficiency of the two-high finishing stand could also be increased. For this purpose the approach roller tables before the stand, the main drive, and scale-removing operations were automated. When the process begins, the operator at the control post for the saws gives the signal for starting the roller tables placed before the stand. The starting of the roller tables is permitted only when there are rolled pieces on them as checked by the PR1 photorelay (Fig. 2). The roller tables are switched off automatically after the piece has been gripped by the rolls of the finishing stand.

The sequence of the automatic control operations of the main drive of the finishing stand is as follows. Normally, the driving motor is running at a low (first) speed. When the piece is gripped by the rolls the electrostatic relay, determining the static load on the motor, is actuated. The relay causes the motor to accelerate up to a predetermined speed. When the PR2 photorelay is screened, the braking of the motor begins, the motor speed is decreased, and the piece leaves the rolls at a reduced speed.

The automation of the two-high mill marked the completion of the automation of a large part of the plant. Then the control of the roller tables between the isothermal heating furnaces and the cooler was automated.

The 900 two-high reversible billet stand (Fig. 3) was also automated. The automation system of the screw-downs of the mill is quite different from the systems in use at blooming mills.

In the system selected for the automatic control of the screw-downs, use is made of the electronic digital computer (Fig. 3). Owing to the introduction of the computer, the amount of relay equipment could be reduced and any required accuracy of the control could be obtained. The object of the system is a rapid and accurate resetting of the upper roll in accordance with the given scheme of reductions. A digital follow-up system with a program control developed by the Works Automation Laboratory has been applied.

At present, the automation of the roller tables and of the main drive of the 900 mill and the modernization of the manipulators are being carried out. The thermal section, the straightening roller machines, and other units of the plant are also being automated.

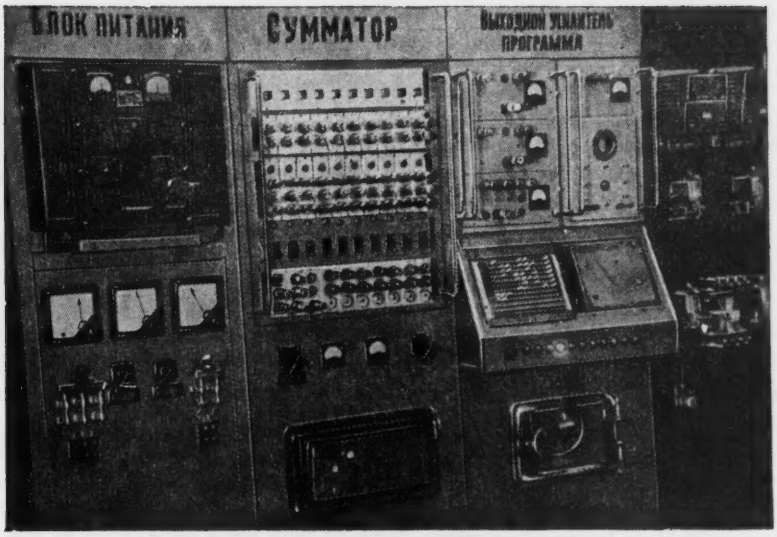


Fig. 3. Electronic computer.

A. S. Bondarenko, head of the Automation Laboratory, N. V. Brazhnikov, chief electrical engineer of the Combine,and B. Z. Mordukhovich, assistant-head of the rail-structural mill,are putting a great deal of effort into work on the automation of the rail-structural mill.

IMPROVEMENT OF THE WIRE-ROD MILL

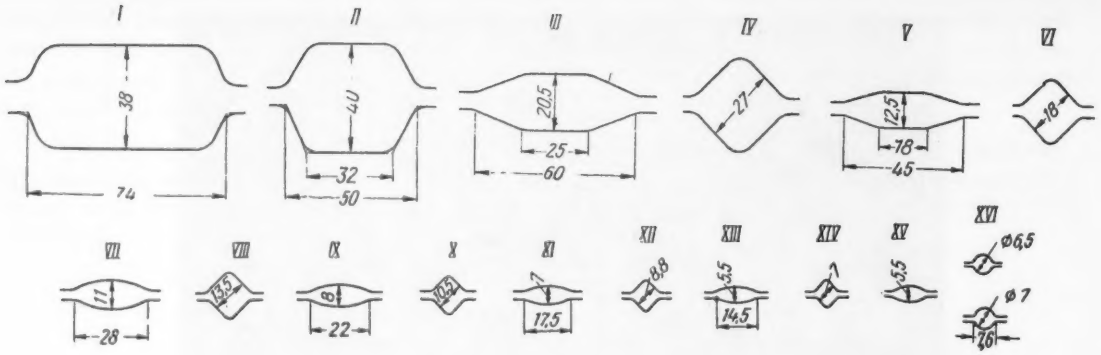
A. A. Davydov and N. V. Litovchenko

The Magnitogorsk Metallurgical Combine

The construction of the rolling mills at the Magnitogorsk Metallurgical Combine was completed when the 250 continuous wire-rod mill, from which the first wire-rod coils were obtained in June 1938, was installed. Up till then, no such mill was in operation either in the USSR or even in Europe. Therefore, it was impossible to predict how the equipment would stand up to the speed of rolling,which was high for that time, and the firm which designed the mill was not eager to pass its "secrets" to our operators. In the course of starting the mill and while mastering its operation, the rolling mill operators of the Combine introduced several modifications and simplifications.

Some constructional defects were discovered when the mill was started. The passes of the roughing train of the mill were designed on the basis of the oval-and-square arrangement which is characterized by the nonuniform distribution of drafts in the passes (the draft in the oval pass is always greater than in the square pass). The deformation of an oval section in a square pass, or a square section in an oval pass, is always accompanied by nonuniform reductions across the section,and these are very undesirable. The nonuniformity of drafts predetermined the distribution-gear ratios which even now cannot be modified without complete replacement of the gears.

Moreover, the diameters of the rolls were wrongly determined by the firm, and hence the gear ratios of the distribution gears became inaccurate and mill adjustment became difficult. These difficulties caused considerable delay in putting the mill into operation.



Present arrangement of the passes for the sections rolled at the 250 mill.

The continuous wire mill is designed for rolling four 5 m-10 m long wire-rod billets simultaneously. We produce, however, wire rod mainly of 6.5, 7 and 8 m lengths.

The mill is provided with one heating furnace. The mill comprises six stands, driven by one common motor, in the roughing train; three intermediate groups (6 stands), each group being driven by one electric motor; and four finishing stands, each driven by a separate motor. Thus, in the line of rolling there are 18 stands; in all, there are 34 stands at the mill.

Billets, 58 x 58 x 9300 mm, are taken by receiving roller tables and transferred to the furnace conveyor. If any defect is detected the billet is thrown into a special container (all equipment is arranged along the conveyor). The billet enters the heating furnace and is heated to 1200°C as it moves along.

The furnace is the one-line type and is fired with fuel oil and a mixture of coke-oven and blast-furnace gases.

On the stands of the roughing train, four billets are rolled simultaneously. There are rotary shears cutting the front ends behind the 6th stand on each of the four lines, and shears on subsequent stands for cutting the piece into short rods in case of a disruption of rolling. The 1st stand has pneumatic emergency shears which are used for cutting billets when necessary.

In the first intermediate group of stands, the rolling of wire rod is also carried out in four lines simultaneously. After leaving the 10th stand, the four lines are split into two groups of two lines. After leaving the 14th stand, the lines are split again and in the finishing stand the wire rod is rolled in one line only. Between the stand groups there are loopers which control the tension of the rolled piece, and in front of the 2nd and the 3rd intermediate groups there are lever type shears for cutting the piece in an emergency. In the finishing train (stands 15th to 18th) odd number stands have vertical rolls and even number stands have horizontal rolls.

The finished wire rod goes to coilers (there are 8 coilers at the mill), and after being wound into a coil is thrown onto the chain conveyor. The coil is then transferred to the rack conveyor at the end of which the coil is tied in two places. By means of a cradle the coil is transferred to a grapple conveyor and goes to the store.

In twenty years of operation, the mill was subjected to extensive design modifications which resulted in a substantial increase in the efficiency of the mill. The output per hour increased steadily and the idling periods were reduced. Whereas in the first years of operation idle periods constituted 35-20% of nominal time, the output of second-grade product amounted to 5% of the total output, and the steel consumption coefficient was 1.078, now idle periods constitute not more than 7% and the steel consumption coefficient is 1.035. This improvement in technical and economical production indices is due to the intensification of the rolling process, an increase in the speed of rolling, and strengthening of separate parts of the mill. Whereas the design mean-draft coefficient was 1.285, it was later increased to 1.33 and then to 1.38.

The oval-square arrangement in the roughing train was replaced by a system of box passes entirely different in principle: rectangle-square and hexagon-square (diamond). This system was found to be more flexible

during mill adjustments and it ensured a uniform deformation across the piece rolled; moreover, a general redistribution of the metal in the stands allowed a more uniform distribution of work among the stands as far as possible. The present arrangement of passes is shown in the diagram.

Maximum design speed of the mill was 21.5 m/sec (according to the speed characteristics of the electric motors of the finishing stands). At present, the speed is increased to 26.3 m/sec. When the speed of rolling was increased, the electrical equipment was modernized: winding of the main motor of the roughing train was increased and so the speed characteristics of the motor were modified; the characteristics of the motors of the finishing stands were also modified; at the same time electric motors were gradually replaced by faster and more powerful ones in the roughing, the first intermediate, and the finishing trains.

Changes in the technology entailed changes in the mechanical equipment. Throw-off equipment for defective billets was installed at the charging platforms before the furnaces and thus the delivery of the billets to the furnaces was speeded-up and the work in this section was facilitated; the gear ratios for the second and third group of stands were reduced and thus it was possible to increase the number of revolutions of rolls without changing the driving gear; the delivery speed of the finished product from the finishing stand was increased and the coilers were modified; the rotating cylinders were removed and only the guide tubes were left, so the load on the drive was reduced and the service life of the machine was extended; the coilers were provided with guides for limiting the scatter of the windings, the coil being better formed; and the loopers and the looping pits between the first and the second intermediate groups of stands were replaced. The new looping guides are reliable in operation and require no special maintenance.

The reconstruction of the tables between the stands of the roughing group and the improvement of the roll housings resulted in a quicker change of rolls and change-over to new pass arrangements. The durability of the rolls has been increased.

Loop formation at the finishing stand, the control of the progress of the piece on the stand, the switching-in of shears, and other operations at the mill have been fully automated. At present, in collaboration with TsLA (Central Laboratory of Automation), we are working on the introduction of an instrument for the automatic measurement of the diameter of the section in the course of rolling.

At the time when the mill was put into operation the Combine had no qualified specialists. K. I. Burtsev, former head of the wire and strip plant, now head of the Metallurgical Industry Department of the Cheliabinsk Sovnarkhoz (Council of National Economy); engineer A. A. Petrov, former head of the mill, now retired, and A. L. Pinegin, former senior foreman at the mill, now retired, contributed a great deal of effort during the introduction of the mill. As time went by a body of skilled operators developed. At present, our foremen have 14-15 years practical experience and all of them went through the technical school and the advanced course for rolling mill foremen. Foreman B. I. Burylev studies at the Mining and Metallurgical Institute, and foremen P. R. Petrov, N. N. Tokmianin, I. G. Zybenskii, and M. S. Raevnin are preparing to enter evening technical school. As a rule, the senior mill operators have been working at the mill for 10-15 years, and all of them are graduates of trade schools. Mill operators I. V. Aksenov, S. Ia. Nizhnik, N. N. Gur'ianov, I. G. Iurin, A. S. Kalinich, V. Nikitin, and M. Mochilskii graduated from the school for foremen in the steel rolling industry. They have fully mastered production technology and ensure efficient production.

Veterans at the mill – furnace operators I. E. Govgalenko, G. I. Chesnokov, I. N. Sabel'nikov, I. S. Martynov, N. T. Gomozov, and others – ensure regular production by their well-coordinated work.

The operators at the control posts have fully mastered the complex automation of the mill. Operators A. M. Dereviankin, M. N. Farion, E. S. Raevnina, V. N. Melnikova, Z. Ia. Kostenko, M. P. Shtodina, G. Popova, M. P. Astapova, E. T. Meshchukova, and other operators work with confidence and a good knowledge of their job.

While celebrating the twentieth anniversary of the beginning of operation, the personnel of the mill is determined to continue to improve the production methods and to increase productivity.

THE SUMGAITSK TUBE WORKS

V. Goncharenko

Azerbaidzan's petroleum industry consumes an enormous amount of tubes. It is an uneconomic proposition to bring them from distant works in the Ural and in the South. Hence, the erection of the Sumgaitsk Tube Works, near Baku, has been started.

The Works grows from day to day and its output increases. In the summer of 1957, the 850 roughing mill was put into operation. Applying advanced methods, the workers of Sumgaitsk Works steadily increase the rate of production.

The Sumgaitsk tube workers study the experience of other works. They visit other metallurgical establishments in the country and themselves receive guests from these establishments.

During the inter-works course for tube mill operators, the member of the course visited petroleum workers in Baku. The Works is frequently visited by various delegations from countries ruled by people's democracies. Chinese students of the I. M. Gubkin Moscow Petroleum Institute have visited young workers in Sumgaitsk.

The Sumgaitsk Works is provided with modern, Soviet-made equipment.

The workers at Sumgaitsk not only know how to work well but also how to enjoy recreation. There are performances by the variety group of the Dzh. Dzhabarly Palace of Culture which visits the works periodically.

A. Pchemiana.

ADVANCED EXPERIENCE FOR ALL METALLURGISTS

FRIENDLY COOPERATION

P. P. Lygun

Deputy to the Supreme Soviet of the USSR
Senior furnace attendant of the Dzerzhinskii Works

In common with all the metallurgists of our country, the blast-furnace operators at the Dzerzhinskii Works celebrate Metallurgist's Day. In the first quarter of this year the personnel of our blast furnace produced 3,989 t of pig iron over and above the planned target. But this is by no means the limit. We shall double and treble our efforts to produce more steel for the towns and the industry of our dear country.

The personnel of our furnace gave up the remuneration-by-points system which impeded the normal operation of the furnace and caused unnecessary tension between the furnace operators. After all, it is no secret that during the shift change some workers and foremen tried to "earn" some more points at the expense of other workers who, in their turn, "robbed" points from the shift they were replacing. It is no secret either that some foremen used to tell their furnace attendants: "What sort of a furnace attendant do you think you are if you are unable to find some irregularities when taking over from the preceding shift, and so lose points for our team!" And that was why some attendants would make a fuss about trivialities: a bit of rubbish left by the previous shift or any other small carelessness which they could easily attend to themselves.

The personnel of our furnace decided to finish with that system. Foremen, furnace attendants, and gas operators are always ready to help each other. Sometimes the furnace attendant of the shift which is taking over asks the foreman for permission not to attend the shift-change meeting in order to help his mates in putting to right any defect in the equipment.

Every worker is aware of his responsibility and does his best to justify his colleagues' confidence and to hand over the plant to the next shift in good order. All the four teams which operate the furnaces work enthusiastically. Helping each other in our work, we mark Metallurgist's Day with new successes in production.

INCREASING PIG IRON PRODUCTION

G. S. Gorshkov

First furnace attendant of No. 4 blast furnace at the Magnitogorsk Metallurgical Combine

The Communist Party and the Soviet Government always look after the welfare of the people.

When the working day was changed to a 7-hr day and the new system of remuneration was introduced at the blast-furnace plant of our Combine, the wages increased considerably. Owing to the mechanization of labor-consuming operations, an efficient planning of the working day, the elimination of working-time losses, and the combination of duties, the setting up of the fourth shift team caused an increase of only 10 men in the blast furnace plant's personnel. We calculated that without those arrangements the personnel of the blast furnace plant would have been increased by more than 100 men.

The blast furnace plant will mark Metallurgist's Day by tens of thousands of tons of pig iron produced over and above the planned target. Owing to a careful use of coke, ore, sinter, and other materials, more than 4 million rubles was saved.

I began my work at the blast furnace plant 26 years ago, in March, 1932, initially on pig iron transport and then as a furnace attendant. The youth of today can hardly imagine the conditions under which we had to work. Breakdowns and stoppages were hindering the utilization of the full capacities of the blast furnaces. Frequently, hot metal and slag were spilled over the railroad track, tons of coke were thrown out through burnt-out tuyeres and all this had to be cleared away manually, regardless of a frost of −30° C or a summer heat. There is no comparison with present-day conditions at our plant.

At present, the furnaces are provided with the most modern equipment, all furnaces have screened burners, and a single-spout hot metal pouring has been adopted.

In recent years, the output of pig iron has been increasing continuously. The operation of the blast furnaces was changed from six to seven at first and then to eight tappings of iron in 24 hours.

LEARNING FROM THE EXPERIENCE OF LEADING WORKERS

A. Kostenko

The country obtained the first batch of pig iron from the Cherepovets Works nearly three years ago. Eight months later the second blast furnace was blown in. Cherepovets' blast furnace operators are not delaying in making use of the productive capacities of the Works. Learning from the experience of leading workers, our personnel is increasing the output of pig iron.

This year, the blast furnace plant undertook to produce 40,000 t of high-quality pig iron over and above the planned target. Senior blast furnace operators pass on their wide experience to young workers. Young engineers and foremen, V. Melnichuk, V. Solodkov, and others, work successfully side by side with experienced foremen, N. P. Sapozhnikov and M. G. Pan'shin.

V. N. Tsukanov came to us from Magnitogorsk as a senior gas operator, and now he is one of the best blast furnace foremen. R. G. Melnikov, a Cherepovets man, joined the plant in 1955 and has been working for the second year running as a senior furnace attendant competing successfully with I. S. Grechuchkin, a well-known furnace attendant. V. Aleksandrov and N. Lavrov are working well as second furnace attendants and frequently replace a senior furnace attendant.

The blast furnace workers of Cherepovets are enthusiastic about their work. We mark Metallurgist's Day with new production successes. Always adopting the experience of leading workers, we endeavor to give our country as much pig iron as we can.

THE VOCATION

A. Kleshchevnikov

Chairman of the blast furnace plant committee at the KMK

In everybody's life there are moments which predetermine, as it were, his destiny. The decision of the Communist Party and the Soviet Government to built the Kuznetsk Combine was such a turning point in the life of Luk'ian Viktorovich Silitskii. Who knows what would have been Silitskii's career but for the erection

of the Siberian giant of the ferrous industry in the foothills of Alatau, then a wild and uninhabited region. He might have become a miner, a gold-prospector, a constructor, or a collective farmer – after all, in our country everybody can choose the work he likes.

Apparently, however, there are not only painters, poets, and composers by vocation but also furnace attendants by vocation. His chosen occupation is most important and essential for Luk'ian Viktorovich. He puts all his efforts into heavy and sometimes dangerous work at the hearth of the blast furnace.

Some people find it difficult to understand where is the poetry of the furnace attendant's work. What is so interesting in working with a red-hot stream of metal under blazing heat; what pleasure is there in working night shifts when everybody else is asleep, or on holidays when all your friends are enjoying themselves?

Sometimes the tired furnace attendant will start grumbling about his work, but just try suggesting to him that he should change his job – he will give you a look of astonishment.

As pictures express art and fulfill the creative dreams for the artist, so do the tons of pig iron for the furnace attendant.

I meet Luk'ian Viktorovich frequently after work. He is a tall, broad-shouldered, 45-year old man with thoughtful grey eyes. When looking at him you find it hard to believe that he has thirty years of work behind him, including twenty six years at the furnace hearth.

A farmer's boy, Luk'ian from Tolkino village in the Kemerovsk province trod unbeaten tracks to become a blast furnace worker. For four years he was a mine digger, worked as a navvy, and then was a concrete worker at the construction site of the first blast furnace of Kuznetsk. He was not looking for an easy job and easy money but for places where strong, hardy and brave men were needed.

In April, 1932, he was standing together with other builders of Kuznetsk, and was avidly and searchingly looking at the first stream of hot metal flowing out of the taphole. He was full of thoughts, solving a complicated problem: what to do next? Should he remain a concrete worker, at a familiar job where he was known and respected, or should he take a job at the blast furnace where determined and brave men were needed, where he would have to begin at the very beginning. And so Silitski became a worker at the blast furnace.

The friendly community of the Kuznetsk blast furnace workers was very helpful to the young furnace attendant. The fight against breakdowns in the first days of operation, the accumulation of experience when working with Rovenskii, B. N. Zherebin, A. F. Borisov, D. A. Shtyrev and other skilled blast-furnace workers, a good retentive memory and a determination to master the new job helped Luk'ian Viktorovich in overcoming all difficulties. The difficulties were many: the hearth of the blast furnace was served by 12 to 15 men, and the cleaning of troughs and runners, carrying of sand and refractory materials, opening of the iron taphole, closing of the slag notch and other jobs were done manually. The smelting operation was carried out by rule of thumb and the gas housings had only 6 to 8 rather inferior measuring instruments.

Silitskii was critical of many an aspect of the organization of work at the blast furnace hearth. With his frankness he frequently criticized the shortcomings at meetings and production discussions, and gave his well-thought-out proposals. He was strongly against breaking pig iron sand troughs after each tapping and, arguing with the senior foreman Rovenskii and other furnace attendants, he ardently defended his idea. He was first to start fettling the troughs by a new method: he did not remove the sand down to the lining, but only cleaned the trough of the scrap and the burnt upper part and smoothed out the sand; then he took a thin (1 to 2 in) layer of wet sand, rammed it

thoroughly and dried it with coke-oven gas. Such runners lasted for 3-4 tappings.

Soon afterward, Lukian Viktorovich suggested that the distribution box be made of clay instead of sand. Boxes made of sand had lasted for only 2-3 days. The boxes made of clay proved to last for 10-12 days. In order to increase the life of the blast furnace runners and of the distribution box, Luk'ian Viktorovich felt that the composition of the clay mixture should be changed. His suggestion was not accepted. Silitskii then wrote a letter to the blast furnace plant of the Magnitogorsk Combine. The new composition was investigated and approved by the Magnitogorsk Combine. After that our Combine began to use it too.

"He is a restless and persistent man, he will get what he wants." So say the people about Silitskii.

And it is true. An expert in his job, a furnace attendant with great experience, he has contributed a great deal to facilitating the work of his colleagues. But has everything possible been done in this direction? Here is Luk'ian Viktorovich's answer: "A great deal has been done but not everything. The duties of the five attendants are rather many, although the work is much less arduous than in past years. The most arduous work is on cleaning and preparing the runners. This operation should be mechanized. And we shall achieve it."

There is no doubt that the Kuznetsk blast furnace operators are capable of solving this involved problem. Creative efforts and love of their work were conducive to the introduction of many a new device and machine for easing the work and for improving technology. They were the first blast furnace operators in the country to introduce humidified blast, automatic operation of air-heating stoves, and automatic charging of the furnace.

The blast furnace workers of Kuznetsk are proud of their colleague – senior furnace attendant Luk'ian Viktorovich Silitskii.

AN INDUSTRIOUS LIFE

A. Andrianov

Foreman at the sinter plant of the MMK

Captain Nikolai Dmitrievich Gorbunov spared no efforts in the battles of the Great Patriotic war. After being demobilized in 1954, he returned to his home town, Cherepovets, and started work at the sinter plant.

Nikolai Dmitrievich acquired practical experience at the Magnitogorsk Metallurgical Combine, one of the best industrial establishments in the country. When he returned from Magnitogorsk, he became an operator and very soon a senior operator at the sinter plant of the Cherepovets Works. Well disciplined and exacting towards himself and his subordinates, N. D. Gorbunov gained great prestige among the workers at the plant. Giving personal example and taking a conscientious attitude towards work, he raises the responsibility of his team members for entrusted work. He is always ready to share his knowledge with other operators and he introduces better and advanced methods and equipment at the plant with great perseverance. N. D. Gorbunov was awarded the title of "Outstanding Sinter Plant Operator" for his achievements in production for seven months in succession.

N. D. Gorbunov is not only an outstanding industrial worker but he is a remarkable social worker too. As deputy chairman of the trade union plant committee, he endeavors to improve trade union work and to enhance the prestige of the trade union organization. At the beginning of this year, N. D. Gorbunov became a candidate member of the KPSS.* The workers of the plant are confident that Gorbunov will justify the confidence of the Party and will not let down the proud title of communist.

*Communist Party of the Soviet Union.

STEEL MELTER A. P. ZHURAVLEV

A. Kablukovskii

The name of A. P. Zhuravlev, steel melter and Deputy to the Supreme Soviets of the USSR, is well known at the "Elektrostal" Works and outside it. Zhuravlev, an old experienced worker, has been producing high-quality steel for over 30 years. In his long service he has made tens of thousands of tons of steel.

Thanks to their wide experience, the team under steel melter Zhuravlev attains high productivity year by year and month by month. The output of steel in 1957 increased by 13% as compared with 1956, and the quarterly output in the first quarter of this year amounted to 115%. The amount of rejected material in the past three years decreased from 0.99% to 0.73% to 0.12% respectively.

For all the members of Zhuravlev's team it became an unwritten but inviolable law to exceed the established norm of output every day. By saving time in every operation, the team attains a high productive efficiency.

The personnel of the No. 1 steelmaking plant took first place in the socialist competition on many occasions. These successes are due to the high skill of workers and technical staff, as the foreman steel melters Zhuravlev, Krasikov, Zakharov, Novikov and many others always pass their experience on to the young workers.

Ignat Mosal'skii, a former student of the trade school, is the best steel melter at the plant and in the near future he is going to take the Technical Diploma examination. Aleksei Petrovich's son, Viktor Zhuravlev, joined the plant after military service in the Red Army; he mastered quickly the trade of the steel worker under his farther's guidance and for the second year he is working on his own as a steel melter at the electric-arc furnace. Steel melter, Nikolai Vasil'chikov learned the skill of high-quality steel production from A.P. Zhuravlev, V. N. Zakharov and other outstanding steel melters at the plant. Working now as a steel melter, he himself uses new methods in some industrial operations.

The study of and conclusions drawn from the advanced methods used by leading workers of steelmaking plants are very valuable in finding and introducing new, most efficient methods in steelmaking practice, which methods would ensure the highest output and a high quality of production. Continuous studies and exchange of experience help the steel workers to make better use of available productive capacities.

I AM PROUD OF MY WORK

F. Filimoshin

Steel melter of No. 21 furnace of the No. 3 open-hearth plant at the MMK

Far beyond the Cheliabinsk province is situated our famous Magnitogorsk – the town of iron and steel. This town, which grew up during the first Five-Year Plan, was built by the whole country. At that time I could not even dream that I, a simple peasant boy, would be making steel, about which all I knew was that it was used for making the ploughs with which we tilled the land.

I have lived in the Ural since 1925. In 1927, when the construction of the Magnitostroi railroad was begun, I took up work as a carpenter and driller, and a year later our team arrived with the first group of workers at the site of the future town. We lived in tents and built huts for the coming builders. By 1930, workers like me were regarded already as "old-timers."

I took part in subbotniks* on the construction of the first blast furnace. In 1931, by the arrangement of the Komsomol, I was sent to the FZU school to learn the trade of steel melter's assistant. So my dreams came true. I became steel melter's assistant in No. 1 open-hearth plant. Each day I learned something new, asked questions of my seniors, and always had to come to the conclusion that I had still a great deal to learn. In 1935, three years after leaving the FZU school, I carried out the first heat on my own.

It is even difficult to say how much steel has been produced since then. But I rejoice when I recollect the first years of our work and compare it with present conditions. What advances have been made in the open-hearth industry! Nowadays, automation has taken over the work of the steel melter, and all I do is control the instruments.

Previously, four assistants and a team of repairers were employed at the furnace and the people were working to the point of exhaustion. Now, only three assistants are employed at a large open-hearth furnace and they cope with all the work. The fettling of the furnace is done by machine, and the loading of deoxidants and their delivery to the furnace have been mechanized.

Each year we increase steel output. Take, for instance, the third open-hearth plant where I am working. In the last year, 1957, we increased the output of steel per worker by 82 t as compared with 1950. And in four months of this year my team produced 800 t of steel over and above the planned target. "Let us work better today than yesterday" — that is how we respond to the care the Party and the Government takes of us workers.

I should like to say a few words to our young metallurgists. For my long services I have been rewarded with the Order of Lenin, the Order of the Red Banner of Labor, and several medals. And you, Lenin's brave youths, should increase our industrial achievements. Work as well as does Peter Gubin, the youngest of my trainees, who is now a steel melter at our plant.

EVERYTHING FOR OUR COUNTRY

S. Baev

Steel melter of No. 3 furnace of the open-hearth plant at the KMK

In response to the call by the Party I arrived at the Kuznetsk Combine together with other young people from an Altaic village. Until then, I had only seen an iron and steel works on photographs and at first I thought that I should never understand this enormous works and the complicated equipment. But the confusion passed and soon I was carried away by the turbulent life, full of hard work and heroism.

At that time, V. V. Maiakovskii wrote in his famous poem "The Tale of Kuznetskstroi and of the People of Kuznetsk" how we had to sleep under wagons, under tents, or in overcrowded huts. We were frequently short of bread, and sugar was considered a luxury. But cheerful songs were always heard in the youth hostel. Friendship and mutual assistance prevailed everywhere.

Of course, if we had been watching the clock all the time, waiting for the change of shift, the Combine would not have been ready even in five years. Our shock brigades, however, imparted their enthusiasm to everybody. I was engaged on the construction of the steel rolling plant, which later was subdivided into cogging, rail-structural, plate and other mills. Foundation pits were dug, buildings were erected and equipment was installed. I was working as a fitter's apprentice.

Everybody wanted to work overtime. And almost every day work went for an extra four hours or so. Studies were not neglected. We were learning to read and write in the schools for illiterates and eagerly listening

* "subbotnik" — unpaid labor freely given to the state on Saturdays and also on days off or holidays. Translator's note.

to the instruction in the technical groups. On Sundays we would assemble outside the huts and, with songs accompanied by the accordion, march again to "voskresnik".*

Later I was transferred to the forge shop where parts for equipment were made. After my service in the Red Army, I came back to Kuznetsk and could not recognize the old place. Heaps of bricks, piles of steel girders – all this had disappeared. In huge buildings, work was in full swing. At the place where I had been working, the cogging mill operators were busy.

I became interested in steelmaking and joined the first open-hearth plant. At first I was a repairer, then assistant to the furnace attendant, and at the time when the war started I was allowed to take charge of the furnace. The difficult work of the steel melter became even more strenuous and responsible at that time: we were producing steel for victory over the enemy. The desire to chase out the fascist aggressors from our country quickly gave us more strength in our efforts. On occasions, we had to spend nights at the plant in order to watch the process when a new type steel was made. We were very careful not to waste costly deoxidants, fuels, and refractories, and we kept thorough maintenance of the furnace and so extended its service life between campaigns. This thrift and time economy on all furnace operations became the style of our work. After the war, when we saved about two million rubles and introduced speeded-up methods of steelmaking, I was awarded the Stalin prize.

Many changes have taken place at the furnace during my years of work. The furnace control has been automated and almost all labor-consuming operations have been mechanized. The time when the shovel was in constant use belongs to the past.

New technology is introduced and new workers join the industry. Looking back on my youth I wish to say from the bottom of my heart to our young people:

"Treasure all that your fathers have done in their youth; make use of their experience and maintain their traditions: everything for the country, everything for the nation."

THANKS TO THE PARTY

P. E. Protasov

Charging machine operator of the No. 2 open-hearth plant at the MMK

More than 25 years have passed since the day when I, then a youth, came to work on the construction of the Magnitogorsk giant of the ferrous industry. It was my fortune to carry out the first charging of No. 1 open-hearth furnace. On July 8, 1933, the first batch of Magnitogorsk steel was cast.

I recollect the long and difficult road covered by the metallurgists of Magnitogorsk. Great difficulties were experienced in the operation of the open-hearth plant, and there was a shortage of skilled workers and qualified technical personnel. Specialists had to be brought from other works and the training of young workers had to be speeded up. By 1940, the construction of open-hearth furnace plants at the Combine was completed. And by that time new qualified metallurgists were available.

The Party and the Government always showed great concern about our well-being. Additional payment was given for working away from home and young workers were given comfortable quarters.

During the Great Patriotic War and after it, many Magnitogorsk workers were given State awards. Among those workers I was awarded three orders and two medals.

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* "voskresnik" – unpaid work on Sundays (c. f. subbotnik). Translator's note.

A great occasion in the life of the metallurgists was the change to the 7-hr. working day and at the same time a 20% pay rise.

On the occasion of the Metallurgist's Day I would like to say: "Thanks to the Party for all the attention it shows to us, the rank and file workers."

STEEL-MELTER AND INNOVATOR

O. I. Iatsunskaia

In 1943, during the hard times of the Patriotic War, a sixteen year old youth, Anatolii Subbotin, came to the "Serp i Molot" Works. He started work as the third assistant to the steel melter at the open-hearth furnace and proved to be an orderly, energetic and conscientious worker. The "grandpa" of Moscow melters, Fillip Ivanovich Sveshnikov, and the young steel melter, Vasilii Andreevich Grudkov, gave Anatolii Subbotin a thorough training in the art of steelmaking.

A. Subbotin's Performance During the Fifth Five-Year Plan and During 1956-1957

Year	Completion of plan	Fuel consumption —saving, + over-consumption	Steel output per 1 m sq of furnace hearth		Number of heats carried out ahead of schedule
			planned	actual	
1950—1954	101,1	+333,9*	7,99	8,08	38,8
1956	102,3	—53,0	8,02	8,23	31,2
1957	103,2	—59,0	8,23	8,50	73,0

* The over-consumption occurred during change-over to magnesite-chromite roofs.

It was difficult at first, but gradually the work became easier and, above all, more interesting; there was a desire to make one's own contribution to the increase of steel production.

Having quickly mastered the duties of the second and the first assistants, in 1949, A. Subbotin became a steel melter and was put in charge of the youth team of No. 4 open-hearth furnace. The furnace was technically better equipped than the others; the control of the heating regime was automated; oxygen was used in steelmaking in this furnace for the first time in the Soviet Union. The performance of the young steel workers was at a high technical level and they were steadily improving their knowledge. The work of the youth team steel melters was highly appraised: for technological improvements, all members of the team including Anatolii Subbotin had the honor of becoming Stalin prize laureates for technological improvements.

In 1951-1952, Anatolii Subbotin studied, at a course on advanced practices, the methods of leading steel melters of the plant who achieved high productivity by reducing the duration of the heat. Subbotin learned how to maintain a high thermal regime of the heat, increase the velocity of reactions and organize operations efficiently. Continuing to improve working methods, he achieved an increase in furnace output from 11-12 t to 14-15 t per hour.

In 1954, Subbotin was elected a member of the Presidium of the Central Committee of the Metallurgical Workers Trade Union, where he was an instructor in the productivity section until 1956. During that time, the young metallurgist visited leading iron and steel works in the Soviet Union and in countries ruled by people's democracy and this helped him to widen his technical knowledge.

When he returned to the Works, Subbotin again took on the duties of steel melter at No. 4 furnace and continued to improve the technology of steelmaking and methods of furnace operation.

In April, 1958, Anatolii Subbotin was given the post of a shift foreman. Now he passes his experience and his methods of work to young steel melters. One can be confident that in his new post Anatolii Subbotin will be among the leading fighters for a further increase in production of high-quality steel.

OPERATIONAL EXPERIENCE IS A NATIONAL ASSET

N. U. Paukov

Senior foreman of the 500 mill at the MMK

I was born in 1901 into the family of a poor peasant. After the October Revolution, my family joined one of the first collective farms. In 1919, I joined the Red Army, took part in South front battles,and was wounded. After demobilization, I started work at the Il'ich Works in Mariupol on the reconstruction of rolling mills. Here I decided to become a rolling mill operator.

It was a tough job at that time. I was working at the 400 mill, first as a tongsman and then as an operator, and later took part in putting the 500 mill into operation at the Voroshilov Works where I was working as a mill operator, a senior mill operator, and then as a foreman. In 1934, I was sent by the People's Commissariat of Ferrous Metallurgy to Magnitogorsk.

I was appointed foreman of the 500,mill,which had to be put into operation and adjusted. In order to speed up the training of workers, I always had a talk with the team of mill operators before the start of the shift and explained in detail the task of each worker. During work I taught young workers, giving them advice or practical examples. After the shift, the team remained behind for 10 to 15 min. during which the work and any shortcomings were discussed and some difficult problems explained. The principles of mill adjustment and special features of rolling new section were also explained.

Owing to this method of instruction, young workers, who till then had not even seen a rolling mill, became skilled mill operators in a short time and some of them (B. F. Kuplenskii, L. I. Potapov and others) became rolling mill foremen and have trained many young mill operators.

In 1935, the 500 mill reached its design output capacity and in recent years exceeded it (by a factor of 3 in 1957). Faulty production decreased by a factor of 8.3 and mill stoppages decreased by a factor of 1.6.

The mill operators were improving the technology of rolling. Equipment was improved considerably, especially for rolling flanged sections and rails. Working with chief roll designer B. P. Bakhtinov, we modified the arrangement of passes for rolling beams and girders, and the changes resulted in a marked increased in mill efficiency, simplification of mill adjustment,and improvement in the quality of the product. We succeeded in introducing a universal method for rolling rounds and squares by arranging the passes as box – plain roll – box. The advantages of employing plain rolls are well known. At present, this arrangement is accepted as the standard one for rolling the above sections at the Combine. Operating efficiency on rolling square sections and rounds has nearly doubled.

In the past ten years the rolling of new steel sections was mastered. In the process of introducing special (periodical) section, we came across the difficulty of an inadequate durability of the finishing pass, and to make it by milling proved to be a labor-consuming operation. Owing to the study of the rolling process of this section, in which engineer S. P. Orlov took part, a method of double utilization of the rolls without reconditioning was designed. At present, the production of economical section is being introduced. We supply light-section channel beams Nos. 12 and 14 conforming to the new GOST specifications and we are about to start the production of angles.

In conclusion, I wish to tell our young engineers, foremen, and operators never to be complacent about their achievements, to study their work thoroughly, and to study and benefit from advanced experience in the work.

Remember, comrades, that operating experience is our national asset. Study it and pass it to the young — this is the right way for a further development of the steel rolling industry and an increase in operating efficiency.

24 YEARS AT THE BLOOMING MILL

I. G. Goncharov

Senior operator of No. 2 blooming mill at the MMK

By improving the methods and technology of production, the personnel of No. 2 blooming mill of the roughing plant at the Magnitogorsk Metallurgical Combine exceeded the design capacity of the mill a long time ago and now rolls nearly twice as much steel as in 1940.

I began my work at No. 2 blooming mill in 1934, after completing a training course for operators. Initially, I was working as the operator at auxiliary posts and as the second operator at the main control post; at the same time I was learning the duties of the senior operator.

At the beginning of the Patriotic War, I joined the Red Army. In 1945, after the war, I came back to my blooming mill and started work as the senior operator of the main control post.

We succeeded in increasing the output of the mill by reducing the number of passes and increasing the drafts. In 1950, two additional stands were installed in the line of the 630 mill and thus the number of passes was reduced and the efficiency of the mill in a busy time was increased by 15%. In 1952, a study of the best methods in the work of the main control post operators was carried out; after learning these methods I achieved a high efficiency of the mill by allowing a minimum time for ingot rolling.

When the open-hearth plant increased the output of steel we were faced with the new task of finding new potential sources of output increase at the blooming mill. In 1953, V and G intermediate stands were installed. The blooming mill was thus partly relieved, the number of passes was reduced by two, and the output in a busy time was increased by 20%. Since the speed of ingot rolling increased substantially it became necessary to ease the duties of the senior operator and to ensure a more stable operation of the mill. All this was achieved by the automation of the approach and delivery roller tables and the screwdowns.

In 1957, the output of the mill at a busy time was 27% higher than in 1951.

In 1958, the third team, to which I belong, achieved 103.4% of the planned output in January, 103.6% in February and 103.5% in March. Those successes would be impossible without the well-coordinated work of all sections of the blooming mill. The furnace operators, D. V. Iudaev and A. L. Efanov, take care of the ingots in the soaking pits. The crane operators, S. D. Dubrovskii and A. S. Khabarov, supply the ingots to the mill in time. The mechanic, S. Giziatov, ensures a smooth functioning of the equipment. The mill operator, Fomin, looks after the correct rolling procedure, and the cutter, Lazarev, assists in a smooth operation of the blooming mill and the 450 mill.

INCREASED OBLIGATIONS

A. I. Kravchenko

Senior operator of the tube mill at the Andreev Works

The workers of our Works mark Metallurgist's Day with new production achievements. The personnel of No. 1 open-hearth plant proposed a revision of, and an increase in, the undertakings accepted at the beginning of this year in connection with the Metallurgist's Day and the 12th Trade Unions Congress.

Our team, lead by the Stalin prize laureate, foreman Zhukov, worked well in 1957. We exceeded the annual output target by 2.7% and saved 246 t of metal although we undertook to save 200 t.

We have promised the State that we will achieve the planned output target for 1958 by December 25, and save 250 t of metal. We hope not only to fulfill the obligations we undertook but to do even better. In the first quarter of 1958 our team exceeded the planned production by 6% and saved 169 t of steel. After the major overhaul, the efficiency of our mill will increase.

Our team competes with the Pervouralsk Works team, led by I. I. Chursinov, Deputy to the Supreme Soviet of the USSR. In 1957, Pervouralsk workers paid us a visit with the object of learning our methods. This year we are going to visit them.

At the 10-min production meeting, which is conducted by the foreman or myself before each shift change, the work of the last shift is discussed in detail and the task for the next shift is outlined.

In connection with the change-over to the 7-hr working day and the increased rate of pay, the workers perform their duties with even greater enthusiasm. Inspired by the Party's and Government's decisions for further improvement of our living conditions, the tube mill workers increase their operating efficiency and by their successes bring joy to our country.

Komsomolskaia Street in Rustavi. On the right is a residential house for metallurgists.

THE FIRST BATCH OF STEEL AT THE CHEREPOVETS WORK

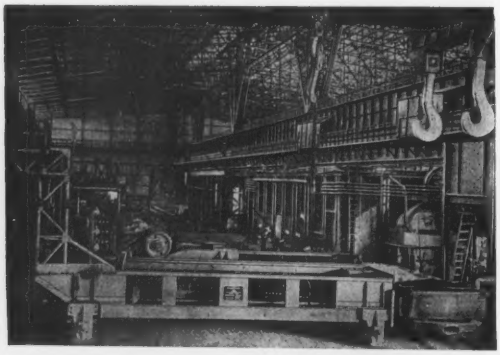
"We shall complete the first open-hearth furnace in April" – was the promise made on the occasion of the approaching May Day by the workers on the construction of the open-hearth plant.

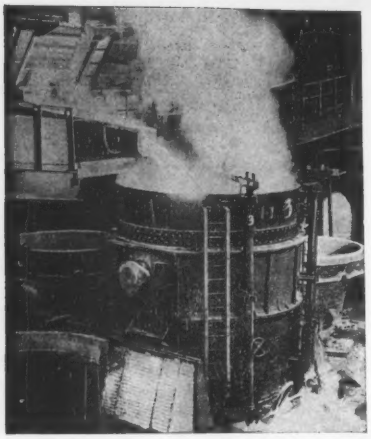
"We shall mark May Day by producing the first batch of Cherepovets steel" – was the reply of the metallurgical workers.

The socialist competition at the building site acquired such impetus that it becamea common event for the teams to complete one and a half times or twice the norm. Other factories and establishments in Cherepovets were helping the builders and the metallurgists.

The undertaking was fulfilled: The constructors handed over the ready plant ahead of schedule.

Under the guidance of the senior foreman of the Kuznetsk Metallurgical Combine, a Member of the Presidium of the Supreme Soviets of the USSR, Mikhail Moiseevich Privalov, who came to assist young Cherepovets steel workers, the furnace hearth was burned in and, on April 30, the first heat was started. At 1:30 a.m. on May 1, the foreman, Iu. P. Gavrilov gave the signal to start tapping. In the morning, at the May Day parade, a 10-t lorry with the first ingot made from Cherepovets steel was at the head of the steel workers' group of metallurgists.





Top: Open-hearth furnace plant at the Cherepovets Metallurgical Works.
Photo by K.M.

Left: Tapping steel at the Cherepovets Works.
Photo by K.M.

THESE MEN ARE NOW STEEL WORKERS AT CHEREPOVETS

Grigorii Nikitovich Averkin began his working career as an unskilled laborer. He had no trade when he came to the Kuznetsk Metallurgical Combine but he had a strong desire to become a steel melter. He worked as a repair laborer, then as steel melter's assistant. And now he is one of the most skilled steel melters of our country.

When sending G. N. Averkin to Cherepovets, the Kuznetsk workers asked him not to disgrace the famous name of the Kuznetsk Combine. And Grigorii Nikitovich has not let down his friends. He did a good job when putting into operation the first open-hearth furnace in Cherepovets and always has been an excellent worker.

G. N. Averkin passes on his experience and knowledge to young workers; ever since the first day of his work at the new open-hearth furnace in Cherepovets he has been entrusting his subordinates with difficult operations and has been training them in the art of steelmaking.

Iurii Pavlovich Gavrilov is a young specialist. He has chosen the right way to become a foreman; after graduating from the Siberian Metallurgical Institute, he worked as foreman in the foundry and then went to the open-hearth plant. Before he came to Cherepovets, he worked at large-capacity open-hearth furnaces.

Cherepovets workers have a high opinion of the efficient organizer who teaches young workers and is learning himself from the experienced steel melters.

The first open-hearth furnace at the Cherepovets Works stood the test of the starting period well and is now in excellent condition. The Cherepovets open-hearth furnace operators are well equipped to start competing with the operators at the Magnitogorsk Combine.

THEY BECAME STEEL WORKERS

D. I. Litvinov

Head of the Work Organization Department at the Voroshilov Works

YOUNG BLAST FURNACE OPERATORS

Komsomol member Evgenii Kosiak has been working at the Voroshilov Metallurgical Works for just over a year. He started at a relatively simple job as the fourth furnace-hearth attendant. But from the very first day of his work, the young man showed promise as a good worker. At present, he is already second furnace-hearth attendant at the 3rd Komsomol-Youth blast furnace.

Two years ago Anatolii Khristiuk, after completing high school, decided to join the blast furnace plant at the Voroshilov Works. Now, the young man is convinced that he made the right choice. He started work as assistant gas operator and now he takes the place of the gas operator. Anatolii combines his work at the plant with studies at the External Mining and Metallurgical Technical School.

The team of No. 2 blast furnace, where Anatolii works, has been exceeding the planned production for some months past. The young gas operator who is mastering his trade with perseverance and success, has made his contribution to the common achievements of the team.

Komsomol member Vitalii Rozhkov and many other high school graduates are working with Evgenii Kosiak and Anatolii Khrystiuk at the blast furnace plant.

AT THE OPEN-HEARTH FURNACE

When the team for the new 500-t open-hearth furnace, No. 9, at the open-hearth plant had to be selected, the name of Leonid Ianulis was one of the first to be put forward. This Komsomol member who graduated from high school just two years ago was well known at the plant; he gained the reputation of a most reliable and keen first assistant steel melter.

Many other high school graduates are employed in several sections of the open-hearth plant. Nikolai Bykov, graduate of a technical school, has mastered the job of charging machine operator perfectly, has been given grade 9 and earns 2000 rubles per month. His colleagues elected him Komsomol Group Organizer of the open-hearth plant team. Nikolai and his colleague, Aleksandr Mal'ko, are preparing for entry to the evening classes at the Mining and Metallurgical Institute, recently opened in our town.

IMPROVING SKILL

In the autumn of 1956, Komsomol member Vladimir Lobachev joined the No. 1 plate rolling plant. The boy, who had just left school, was trained as the operator of auxiliary equipment. Vladimir was reliable in work, keen on taking the advice of experienced workers, and took interest in technical literature.

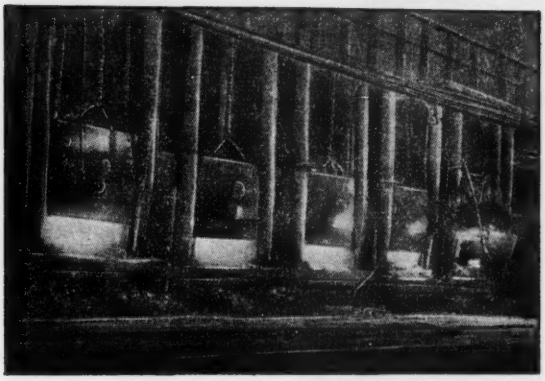
At present, Lobachev is mastering the work at the main control post at the mill; in the near future the plant will have one more skilled operator.

Konstantin Evsuikov, a young operator at the No. 2 plate-rolling plant, joined the Works just at the time when the unique 2800 mill was being put into operation, and he was given a job at the new mill. The young man is now a skilled operator, performing his duties efficiently without a single breakdown or stoppage.

Konstantin Evsiukov is a Komsomol member and an active member of the literary circle of contributors to the town and Works newspapers, which have a wide circulation.

MAIA KONVISAR

Komsomol member Maia Konvisar joined the blooming and slabbing plant two years ago. She had behind her ten years of study at high school and one year in technical school. In the last year she had not only to accumulate theoretical knowledge and practical skill but also to overcome the natural human shyness of one who was never in industry, near noisy machines and rumbling, moving steel. We have to render justice to Maia Konvisar: she soon became familiar with the machinery. She was given the job of duty operator in the machine shop and she is still the only girl on this job. She supervises electrical machinery, puts right any defects, and adjusts the instruments. The young operator performs her duties efficiently, speedily and skillfully.



The 500-t open-hearth furnace at the Voroshilov Works

Maia has embarked on an external course at the Polytechnical Institute. She will become a good engineer. Her work at the start of her career gives a guarantee of her success.

METALLURGISTS OF THE ZAKAVKAZ METALLURGICAL WORKS

Iosif Georgievich Guntskidze joined the Zakavkaz Metallurgical Works in 1951.

Starting as a chipper at the steel rolling plant,he decided to learn one of the metallurgical trades and went to the blast furnace plant as the fourth assistant to the hearth attendant. He is now senior hearth attendant. His team exceeded the planned production target by 2% in the first quarter of 1958 and by 6% in April this year.

Vazha Kapitonovich Gigeberia started work at the open-hearth plant in 1950. Gigeberia advanced from repair laborer to senior foreman of the plant and has always endeavored to reduce stoppages of open-hearth furnaces.

Steadily improving the methods of steelmaking and making time economies on all operation, Vladimir Gavrilovich Chabashvili, a steel melter of the open-hearth plant, produced 167 t of steel over andabove the planned target in the first quarter of this year. In April, Chabashvili's team exceeded the planned output target by 8.4%.

Givi Tarielovich Abramiia began his working career in 1944 when after graduation from high school he became an apprentice electrician at the Zestafonsk Ferroalloy Works.

In 1954, Abramiia was sent to the Stalino Metallurgical Works where he received training as a senior operator of the plate rolling mill and, in 1955, he started work in that capacity at the Zakavkaz Works. He exceeds the planned production target by 5% on the average.

Avtandil Mikhailovich Dzhadzhanidze completed agricultural technical school in 1944 but he was not to work in the trade of his first choice.

At that time, skilled workers were needed at the Zakavkaz Metallurgical Works which was then being built, and A. M. Dzhadzhanidze learned the trade of rolling mill operator thanks to the brotherly assistance of the workers at the Stalino Metallurgical Works and the "Azovstal" Works. In 1950, he began work as an operator of manipulators and, in 1953, he became senior operator of the 900 mill. In the last seven months of 1957, he produced 1,163 t of rolled steel over and above the planned target. He passes on his skill to young workers willingly.

Shota Dzakaevich Kvaitaliani has completed a high-school education. After service in the Red Army, he returned to his collective farm and, in 1951, started work at the water supply plant of the Zakavkaz Metallurgical Works. He was helped in learning the trade of plate mill operator. At present, Sh. D. Kvaitaliani, working as a senior mill operator, always exceeds the planned output target.

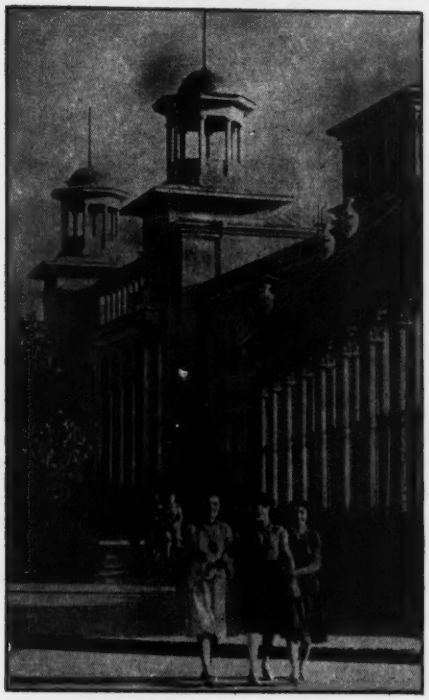
Vasilii Archilovich Kochiashvili came to the Zakavkaz Metallurgical Works in 1956 after having finished his studies at the metallurgical technical school. Soon he was given the job of senior furnace operator of the rolling plant. His theoretical knowledge and acquired practical skill enabled him to exceed the planned output by 1,565 t of steel in the period from October, 1957, to April, 1958.

Before he joined the Zakavkaz Works, Emel ian Sever'ianovich Kurtanidze was a team leader on a collective farm. In 1944, he received training at the Magnitogorsk Metallurgical Combine and the Sulinsk Metallurgical Works, where he learned the job of rolling mill operator, and in 1951, he began work at the tube mill of the Zakavkaz Works as an operator. In the first four months of 1958, E. S. Kurtanidze exceeded the planned production target by 9.7%. Steadily improving his performance, he gladly passes his knowledge to young workers.

After completing high-school education, Givi Bagratovich Suladze answered the call of the Party and the Government and came to the Zakavkaz Metallurgical Works in 1944. After training at the Magnitogorsk Combine and the Dzerzhinskii Works, he came back to Rustavi and began work in the foundry.

In 1952, he underwent a training course at the Nikopol South-Tube Works and returned to his home Works as an operator in the tube rolling mill. G. B. Suladze exceeded the production plan in the first quarter of 1958 by 11.7% and in April — by 17.8%. He adjusts his mill in 20-25 min as compared with 40 min allowed by the specifications.

Georgii Zakharovich Khandolishvili began his work at the repair and construction plant of the Zakavkaz Metallurgical Works in 1953. Soon he was sent to the Dneprodzerzhinsk Metallurgical Works to be trained as a rolling mill operator. Since 1954, he has been working as a rolling mill operator at the Zakavkaz Works and markedly exceeds the planned production targets.



In the Palace of Culture of the Zakavkaz Metallurgical Works there are 22 amateur groups; two drama groups (Georgian and Russian), a choir, a ballet and other groups. The attractive and spacious building of the Palace of Culture is well adapted for the amateur actors' activities.

Photograph: Palace of Culture of the Zakavkaz Metallurgical Works.

Photo: A. Kulenkova.

The repertoire of the Russian Drama Group at the Zakavkaz Works includes plays by Soviet playwrights — such as "The strange child" by Shkvarkin and "The lilac garden" by Solodar. On the 40th Anniversary of the October Revolution the group produced Gorbatov's play "Father's youth."

The Georgian Drama Group of the Zakavkaz Works' Palace of Culture produces classical and modern Georgian plays, such as "Belated repentance" by Kelbakiani, "Kinto" by Tseretelli and other plays.

There is a group of pioneers in the Pioneers' Camp of the Zakavkaz Metallurgical Works that visits the Botanical Garden, and enjoys various camping trips during the year.

The dance group of the Palace of Culture at the Magnitogorsk Combine is famous not only at home but also abroad. In the autumn of 1957, Magnitogorsk dancers were on tour in the German Democratic Republic, where they gave performances in several towns. The performances were very successful.

The Russian Song Choir of the Palace of Culture at the MMK is very popular in Magnitogorsk. Its repertoire includes Russian folk songs, contemporary popular songs, and songs about the town of Magnitogorsk by local poets.

The Drama Group of the Palace of Culture at the Magnitogorsk Combine has been in existence for 25 years. During that time many good plays were shown to the Magnitogorsk audiences. Recently, the plays "Miraculous alloy" by Kirshon, "The hussar girl" by Koni, and "The trees die standing" by A. Kason had great success.

NEW BOOKS

N. P. Zhetvin, F. S. Rakhovskaia and V. I. Ushakov

REMOVAL OF SCALE FROM METAL SURFACES

Moscow, Metallurgy Press, 1957, 109 pages

Several methods of scale removal from metal surfaces, such as mechanical, chemical, or electrochemical, are employed in industry. Some combinations of these methods are also used. The chemical pickling of metal is now the most extensively employed method. In the modern steel treating plants, pickling sections occupy a large space and are provided with complex equipment. However, the technical literature on this important technological process is entirely inadequate. The book "Removal of scale from metal surfaces" by N. P. Zhetvin, F. S. Rakhovskaia and V. I. Ushakov, which describes the operating practices at the "Serp i Molot" Works, bridges this gap in technical literature to some extent.

The book contains an account, in a popular and comprehensive form, of the Works' practice in the pickling of carbon steels, special steels and alloys.

The book is especially valuable in its practical scope; it gives a description of technological processes in use now at several works, and much valuable advice is here included. Of particular interest are the chapters describing base-acid pickling of stainless, acid-resistant and heat-resistant steels and alloys, designs of pickling baths, and equipment for electrolytic pickling.

Continuous pickling of stainless strip involving the use of an alkaline bath, as described in the book, was applied for the first time at the "Serp i Molot" Works and became a prototype for the design of similar pickling lines at other works.

Data on the consumption of materials used in the pickling process are given. At the same time, the authors relate the modern processes of ferrous sulfate production, continuous pickling of metal, electrolytic pickling, etc.

The following inaccuracies should be pointed out:

1. On page 5, reactions of oxide-covered iron with sulfuric acid are given. From the reaction quoted it follows that besides the ferrous salt of sulfuric acid, $FeSO_4$, there exists also salt $Fe_2(SO_4)_3$ in the bath. But, $Fe_2(SO_4)_3$ reacting with hydrogen is reduced as follows:

$$Fe_2(SO_4)_3 + H_2 = 2FeSO_4 + H_2SO_4.$$

Hence, the bath contains only $FeSO_4$ during the operation.

2. In chapter I, among the factors which improve the efficiency of pickling and reduce the consumption of acid, a very important factor is omitted – this is the effectiveness of stirring acid solutions or moving the metal in the bath. Unfortunately, adequate importance is not attached to this factor in industry. The majority of stationary pickling plants at our works have no arrangements for stirring.

3. In some chapters of the book, such alloys as Kh20N80, EI435, EI437 and others are erroneously regarded as steels.

In spite of the above shortcomings, the publication of the book is timely and the book is valuable for engineers, technicians, and workers who have to deal with the process of metal pickling.

V. S. Slavkin.

SIGNIFICANCE OF ABBREVIATIONS MOST FREQUENTLY ENCOUNTERED IN SOVIET PERIODICALS

FIAN	Phys. Inst. Acad. Sci. USSR.
GDI	Water Power Inst.
GITI	State Sci.-Tech. Press
GITTL	State Tech. and Theor. Lit. Press
GONTI	State United Sci.-Tech. Press
Gosenergoizdat	State Power Press
Goskhimizdat	State Chem. Press
GOST	All-Union State Standard
GTTI	State Tech. and Theor. Lit. Press
IL	Foreign Lit. Press
ISN (Izd. Sov. Nauk)	Soviet Science Press
Izd. AN SSSR	Acad. Sci. USSR Press
Izd. MGU	Moscow State Univ. Press
LEIIZhT	Leningrad Power Inst. of Railroad Engineering
LET	Leningrad Elec. Engr. School
LETI	Leningrad Electrotechnical Inst.
LETIIZhT	Leningrad Electrical Engineering Research Inst. of Railroad Engr.
Mashgiz	State Sci.-Tech. Press for Machine Construction Lit.
MEP	Ministry of Electrical Industry
MES	Ministry of Electrical Power Plants
MESEP	Ministry of Electrical Power Plants and the Electrical Industry
MGU	Moscow State Univ.
MKhTI	Moscow Inst. Chem. Tech.
MOPI	Moscow Regional Pedagogical Inst.
MSP	Ministry of Industrial Construction
NII ZVUKSZAPIOI	Scientific Research Inst. of Sound Recording
NIKFI	Sci. Inst. of Modern Motion Picture Photography
ONTI	United Sci.-Tech. Press
OTI	Division of Technical Information
OTN	Div. Tech. Sci.
Stroiizdat	Construction Press
TOE	Association of Power Engineers
TsKTI	Central Research Inst. for Boilers and Turbines
TsNIEL	Central Scientific Research Elec. Engr. Lab.
TsNIEL-MES	Central Scientific Research Elec. Engr. Lab.–Ministry of Electric Power Plants
TsVTI	Central Office of Economic Information
UF	Ural Branch
VIESKh	All-Union Inst. of Rural Elec. Power Stations
VNIIM	All-Union Scientific Research Inst. of Meteorology
VNIIZhDT	All-Union Scientific Research Inst. of Railroad Engineering
VTI	All-Union Thermotech. Inst.
VZEI	All-Union Power Correspondence Inst.

Note: Abbreviations not on this list and not explained in the translation have been transliterated, no further information about their significance being available to us. – Publisher.

JOURNAL OF
APPLIED CHEMISTRY
OF THE USSR

(Prikladnoi.)

in complete English translation

Covers all aspects of applied research: New porcelain glazes; ozone production by silent electrical discharge; hydrogen fluoride as a cracking catalyst; effect of gelatin on the optical sensitization of photographic emulsions. Of particular interest to chemical engineers, due to its extensive coverage of applications in methods and equipment. Translation began with the 1950 volume. Annual subscription, 12 issues, approximately 2000 pages, $60.00 in the U.S. and Canada; $65.00 elsewhere. (Special price to libraries of non-profit academic institutions: $20.00 in the U.S. and Canada; $25.00 elsewhere)

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